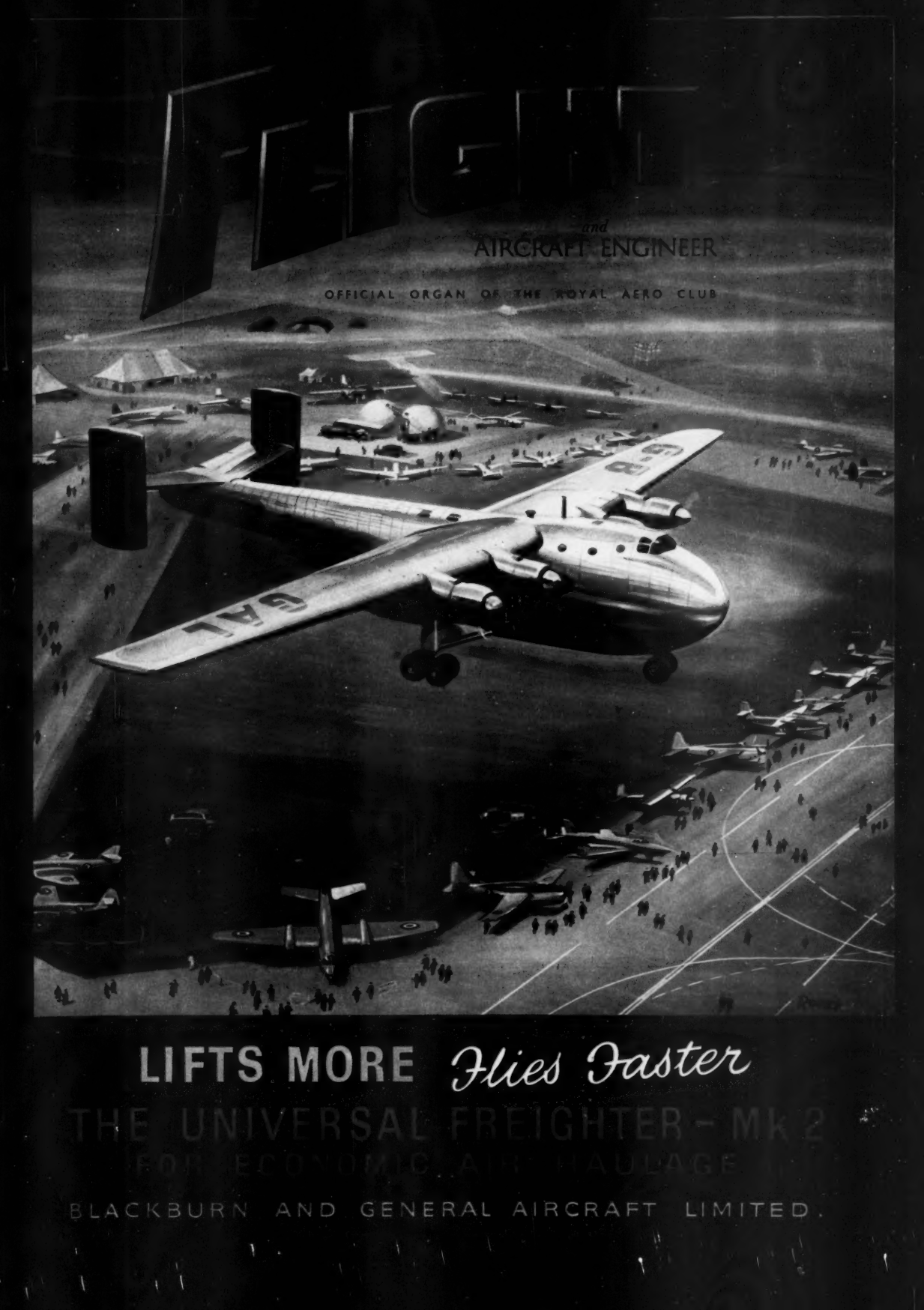
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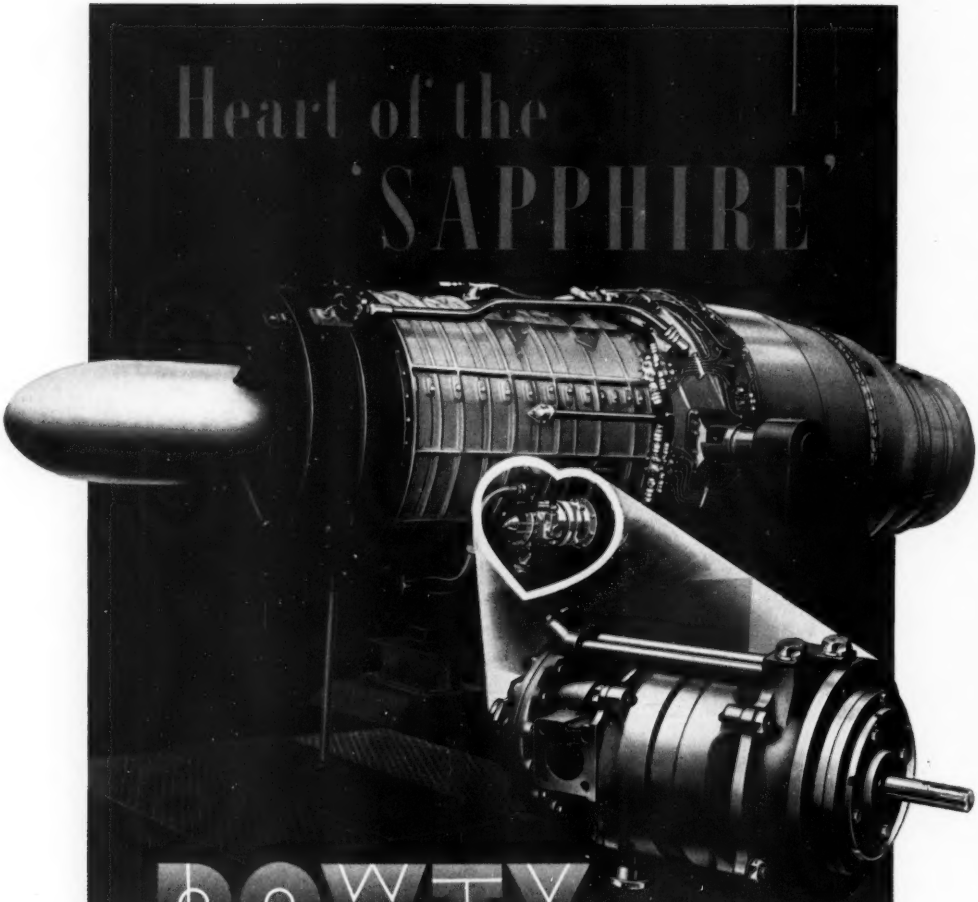

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A

UNITED AIRGRAM

UNITED AIRCRAFT EXPORT CORPORATION

UNITED AIRCRAFT EXHIBITS PRODUCTS AT PARIS SHOW — Products of the four divisions of United Aircraft Corporation, as well as those of a number of their licensees, were exhibited at the Nineteenth International Air Show (Salon International de l'Aeronautique) held at the Grand Palais of the Champs Elysees and at Le Bourget Airport.

Included among the exhibits at United Aircraft's display was a cutaway Pratt & Whitney R-4360 Wasp Major engine, a Double Wasp engine and various engine parts. Hamilton Standard showed an operating cutaway model of its jet fighter cockpit refrigeration unit, and the Chance Vought and Sikorsky Aircraft divisions were represented respectively by models of a Navy Corsair fighter-bomber and a ten-place S-55 helicopter.

Among the licensees who were represented at the United Aircraft display were de Havilland Propellers Limited of England, manufacturers of aluminum and steel; Hamilton Standard propellers; Westland Aircraft Limited, of England, makers of Sikorsky helicopters; Hispano Suiza, of France, which manufactures R-2000 Twin Wasp parts; and Fiat, of Italy, manufacturers of Hamilton Standard constant speed propellers.

United Aircraft Export Corporation, with headquarters in East Hartford, Connecticut, assembled and manned the exhibit.

CHANCE VOUGHT CORSAIR IS STILL FORMIDABLE — Taking up where they left off in World War II, rugged, hard-hitting Corsair fighter-bomber planes, designed by Chance Vought Aircraft, accounted for 82 per cent of all close air-support sorties flown by U. S. Navy and Marine pilots against targets in Korea, according to a recent review prepared by the U. S. Department of Defense.

"Approximately three per cent of air-support sorties are flown by jet fighters, 82 per cent by conventional piston-engine fighters, 15 per cent by conventional attack aircraft," the report stated. The Navy has officially credited Corsairs alone with the 82 per cent of sorties flown.

The jets too, did important jobs in Korea, but the Corsair came into its own again when air operations there were concentrated on low-level strafing and bombing attacks — all specialties which Corsairs had performed with distinction in World War II.

The F4U-5, newest version developed from the basic F4U-1 design, is capable of speeds of 450 miles an hour and better, and has a service ceiling of more than 41,000 feet. It is powered by a Pratt & Whitney R-2800-32W Double Wasp engine

driving a four-bladed Hamilton Standard propeller. Armament includes 20 mm. cannon, bombs, napalm bombs and rockets.

FRENCH NAVY TO GET CORSAIRS — Chance Vought Aircraft recently has received authorization from the U. S. Navy Bureau of Aeronautics for the manufacture of a quantity of Chance Vought F4U Corsair fighter-bombers to be delivered to the French Government under the Mutual Defense Assistance Program. These airplanes will come off a production line now building Corsairs for the U. S. Navy. Because of security regulations the number of aircraft to be built cannot be disclosed.

SIKORSKY'S BIG H-19 PAYS OFF IN KOREA — The Air Force's big ten place H-19 helicopter (USAF version of the S-55) recently underwent its initial combat testing in Korea, and performed an outstanding job in rescue operations.

The H-19 which was sent to Korea for testing made its debut on March 23, 1951, the day after its arrival by cargo airplane.

In its first operation, evacuating injured paratroopers, the H-19 made two trips and rescued sixteen persons. Latest available figures show that it was flown every day thereafter under combat conditions, and accounted for the rescue of 99 wounded soldiers from the front up to May 15. Although the big craft was under heavy mortar and ground fire during several of its missions it received no hits.

Many of the wounded carried might have died but for the fast transportation the big helicopter was able to provide. By ambulance the trip to a hospital would have taken three or four hours, compared to the twenty-five minutes trip by the H-19. And while an ambulance carries only four litters, the H-19 can double this capacity in one quick trip.

Experience in Korea has shown that one Sikorsky H-19 in action could take the place of five H-5s (USAF version of the S-51), thus relieving the smaller helicopters for other duties and evacuations.

It was possible to maneuver the H-19 into closer places than had been expected, and to operate in terrain inaccessible to the older and smaller helicopters. On one trip the H-19 airlifted 1,500 pounds of medical supplies to front line first aid stations and brought out eight litter patients on its return to base.

The H-19 was inspected by top generals and all were pleased to see the work it could accomplish. Pilots who flew it said that it operated flawlessly, and no maintenance problems had been encountered at this writing. Latest exploit of the big H-19 helicopter was to fly United Nations negotiators to the cease-fire negotiations which began at Kaesong, July 7.

SIKORSKY HELICOPTERS RESCUE 2,993 IN KOREA — Military versions of the Sikorsky S-51 and S-55 rescued 2,993 men in Korea, according to official figures compiled in May, 1951. More complete figures are expected to revise this number upwards considerably. However, even this latest statistic is an impressive indication of the brilliant manner in which Sikorsky helicopters have performed under the most strenuous conditions.

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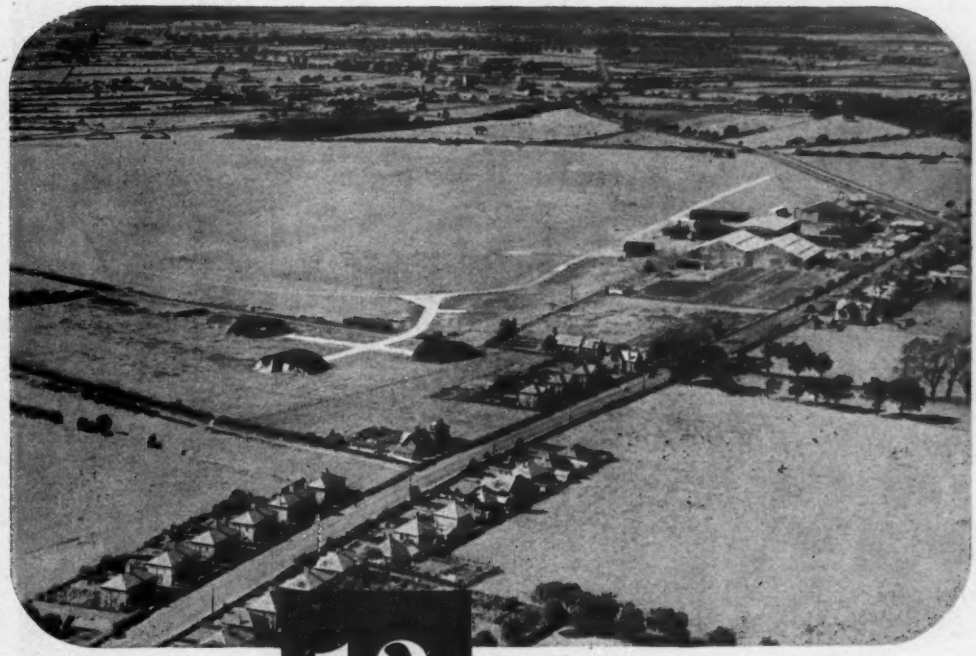

13

Recognise this airfield? It's No. 13 in this series of puzzle photographs. You'll find the answer below on the right.★

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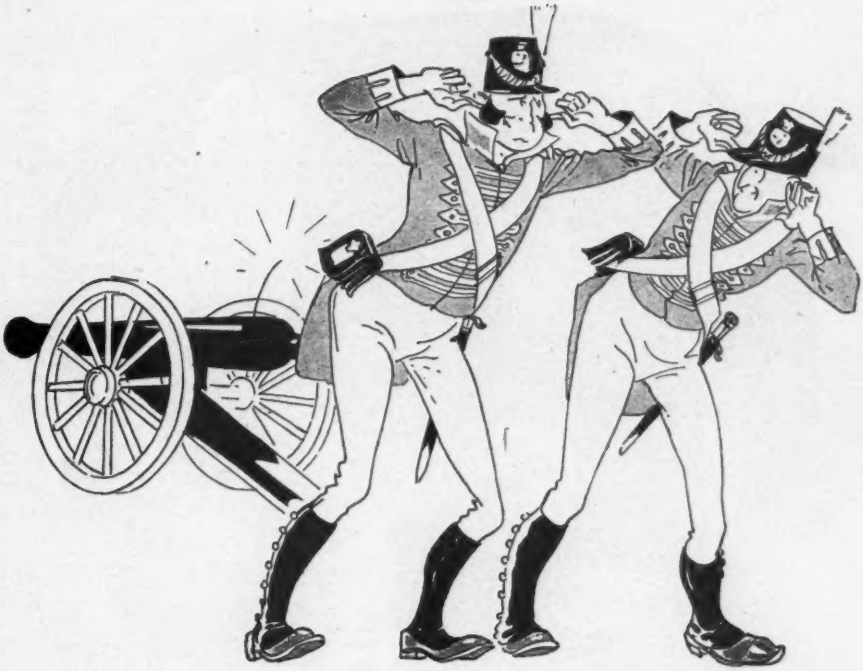

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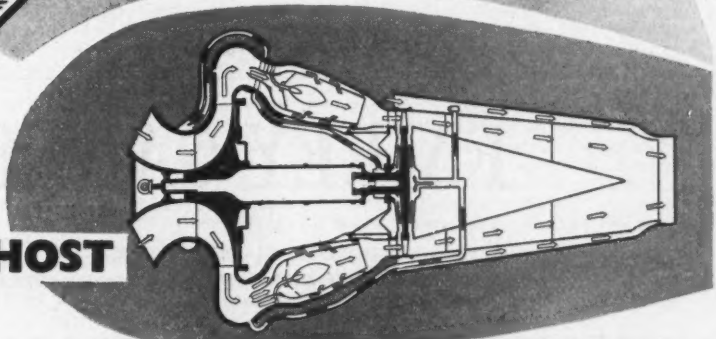

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Founded 1909

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Turbines in the Training Programme

PREOCCUPATION with defence needs and thoughts of front-line aircraft invites the risk that the subject of trainers may receive less than its fair share of attention; yet the quality of the aircraft in which a pilot forms his relationship with the air has a profound influence on his training, and a lasting effect on his flying career.

Within the memory of many Service pilots of the war generation (though, of course, a number can go back much farther) the training syllabus was carried through on only two types : the Tiger Moth and the Hart. The operational machine was, as likely as not, just a newer Hart variant with different military equipment. Conversion and operational training were arranged in the squadron. The changes which have been causing the problems, and which have altered the whole conception of flying training, really started with the general acceptance of the monoplane and the introduction of retractable undercarriages, v.p. airscrews, and flaps.

As a result, Magisters soon joined the Tiger Moths at the elementary stage and an American medium-performance trainer—the Harvard—was adopted, among other types, to keep pace with new equipment and procedures. A third training stage had to be introduced as well to carry the pupil to squadron standard on operational aircraft.

With the coming of the war, great expansion, economy of effort, and rapid technical advances all had to be thought of at once. Considering the few training hours which could be allowed to each pupil, the majority did remarkably well. Subsequently many stages of training had to be accepted and for a typical bomber pilot, for example, they might have been Grading School, E.F.T.S., S.F.T.S., A.F.S., B.A.T.F., O.T.U., H.C.U., L.F.S., and, finally, practice with the squadron.

With peace came the need to collect ourselves after the rush, and to plan a streamlined and economical training machine. The new problems brought in by the gas turbine had also to be considered and it was obvious that more ground than ever before must be covered by a pupil pilot at each stage of his training. In turn, each aircraft type at each unit had to handle more; hence the basic trainer for a start.

Today the situation is not much changed, except that there is even more for a Service pilot to learn. Unfortunately, in spite of the acknowledged value of synthetic trainers and similar devices, no short cut has been found, nor a substitute for flying experience.

Ideas on training aircraft, as well as on operational types, now change more quickly than replacements can be designed, built and delivered. Even so, the Harvards are still with us (and the Tigers in Reserve units) while Balliols are awaited, although the talk is about a quite different jet requirement in this class. The Prentice is to be replaced as soon as possible by the Provost, a type born of hard experience and representing the manufacturer's idea of an aircraft to meet the stated requirements. Nominally a basic trainer, the Provost can nevertheless do all that the Harvard does at present—and more.

Farther up the scale, a simple jet trainer has been advocated recently because the jump to operational jets may be too great. It has been suggested that, after elementary instruction in some light type, the pupil could go at once on to such a machine. The Dutch Fokker S.14 was named as an example, and we believe that at least one counterpart is under consideration in this country. This was an alternative to the ingenuous suggestion that pilots under training should fly their jet fighters "slowly." Certainly it seems logical that in an all-turbine Air Force, piston engines should be eliminated from training at an early stage.

Two-seat Vampire operational trainers are already being built for the R.A.F. These, though converted fighters, have a reasonably low wing-loading and very pleasant and straightforward flying characteristics. What, it might be asked, can Balliols do in the way of advanced training that Vampire Trainers cannot do better ?

Looking a short way ahead, three types may meet training requirements: basic piston, intermediate jet, and operational jet. There are indications that the new Deltas, already freed from airscrews and carrying no flaps, may also be launched and returned to earth without the aid of an undercarriage; and so the original complications are, once more, removed. Has the wheel almost completed its full turn?

Mk 2 UNIVERSAL FREIGHTER

Proposals for an Improved Blackburn and General G.A.L.60 : Centaurus Power and New Tail

DURING the Commons debate on the equipment of the Royal Air Force (see *Flight*, August 17th), it was suggested by Opposition speakers that the capabilities of the Blackburn and General Aircraft Freighter had not received due recognition. One speaker instanced the recent trials at the Staff College, Abingdon, where, in competition with the Fairchild C-82 Packet and a Hastings, the Freighter alone was able to deliver a load of heavy Army equipment on a small grass airfield, and to fly it out again.

Replying to these criticisms, the Secretary of State for Air said that trials were still being carried out with the prototype and that the Air Ministry was not prepared to place an order until the results were known.

On the face of it, this official attitude is surprising in view of the urgency of air military-transport requirements and the amount of flying already done by the prototype. Even more disturbing is the hold-up, now amounting to several months, in the assembly of the finished units of a second prototype; and the delay, we are certain, does not originate in the maker's works.

Meanwhile, as briefly reported last week, there has come the announcement of a proposed Mk 2 Freighter, with improved performance. The major differences will lie in the use of four Bristol Centaurus 171 engines in place of the present Hercules 761s and in the redesign of the rear loading doors and tail.

The increased power will enable the aircraft to carry a payload of 43,680 lb (19½ tons) on short hauls, or 29,120 lb (13 tons) over a distance of 1,000 n.m., with full fuel allowances and with a corresponding reduction in operating costs.

By virtue of its landing and take-off characteristics, and its four-wheel bogie landing gear, the Mk 2 will be able to operate from secondary airfields and remain within the I.C.A.O. performance recommendations. An appraisal of the design features of the Mk 1 appeared in *Flight* March 23rd, 1951, and it is not intended, therefore, to repeat points of interest common to both aircraft.

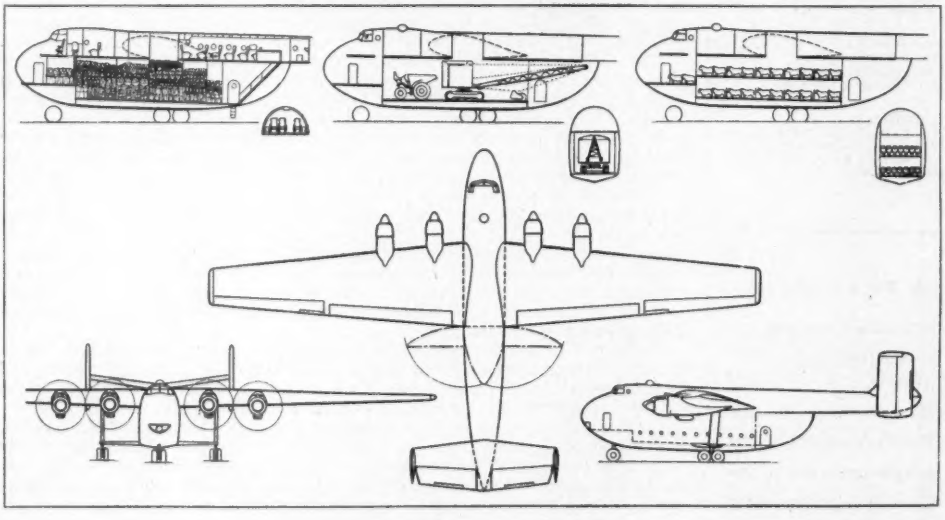
In the Mk 2 the load is carried in an unobstructed freight compartment measuring 36ft by 10ft by 10ft while space is available in the nose for light cargo. The flight deck, which is above the cargo, accommodates a crew of two to four depending upon operational requirements. A new feature is the entrance to the freight compartment which is now through two clamshell-type doors beneath the tail boom, hinged vertically and meeting on the centre-line of the aircraft. A clearance of 13ft 5in is provided under the tailplane/rear fuselage.

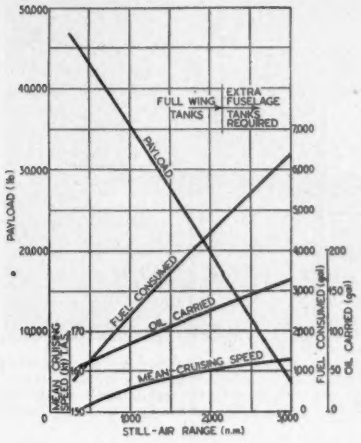
The floor of the freight compartment has been designed to carry concentrated loads within favourable limits. For instance, the maximum permissible axle load is 9,000 lb with pneumatic tyre pressure of 60 lb/sq in. The floor panels, which are replaceable and interchangeable in view of the anticipated wear and tear, are coated with Pheenoglaze walkway finish. The floor is supported by seven equally-spaced longitudinal members, which, apart from housing the lashing fittings, carry off water that may accumulate from rain-soaked vehicles. The floor is provided with 161 lashing points positioned in seven longitudinal rows, each fitting being capable of withstanding a load of 5,000 lb.

Each wall has three horizontal rows of similar fittings positioned respectively 2ft, 3½ft and 6½ft above the floor level and each row has five rings capable of carrying one ton apiece. Twin loading ramps are provided for self-propelled vehicles, the maximum angle of inclination being 18 deg, and these ramps may be folded upwards and housed within the rear loading doors, or removed from their hinges and stowed in the freight compartment. The method of handling stores inside the Freighter, while not so ambitious as that developed by Lockheed Aircraft and reviewed elsewhere in this issue, has been found to be sufficient. An electrically or hand-operated winch provides a maximum tractive effort of 5,300 lb at 11ft/min, or alternatively, a half-ton overhead gantry can be supplied, at a weight penalty of 230 lb.

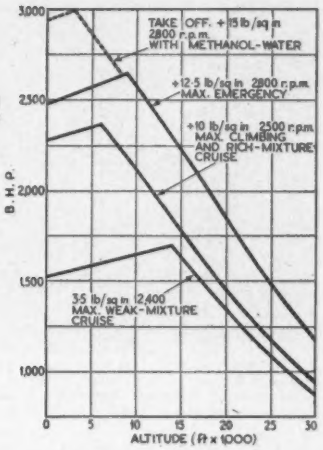
The tail boom will be of surprisingly large dimensions—

The three alternative arrangements of the freight compartment show the extent to which the Freighter may be utilized. Note the 19 seats which are available in the tail-boom, and the clamshell-type loading doors in the general arrangement.





Payload, still-air range, and cruising performance (I.C.A.N.) of the Mk 2 Universal Freighter.


TAKE OFF. +15 lb/sq in 2800 r.p.m. WITH METHANOL-WATER
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+10 lb/sq in 2500 r.p.m. MAX. CLIMBING AND RICH-MIXTURE CRUISE
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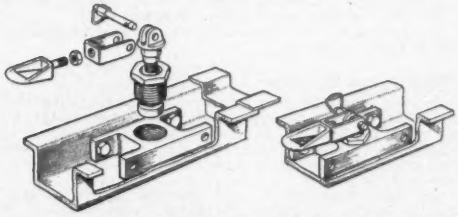
B.H.P.
ALTITUDE (Ft x 1000)

Power at take-off and altitude for the Bristol Centaurus 171.

so large, in fact, that it will accommodate 19 passenger seats. Additional space is provided on the flight deck for another five passengers, though this would necessitate moving the radio operator forward of the flight-deck bulkhead. Access to the passenger deck in the tail boom is by a portable companionway leading from inside the loading doors.



Details of one of the freight-lashing points ("exploded" and assembled). Each is capable of carrying an ultimate load of 5,000 lb.

The Centaurus 171, which develops 2,940 b.h.p. (water/methanol injection) at take-off, is similar to the 661 in current production except that the two-speed supercharger has been replaced by a single-speed unit. The maximum lean-mixture cruising power is 1,700 b.h.p. at 14,000ft. Provision has been made for alternative power plants to be installed if preferred, without major modification. These include the Pratt and Whitney Double Wasp CB-17 or Wasp Major B-13 and Wright 749 C-18BD1. The cooling system of the Centaurus is similar to that of the Hercules, consisting of a spinner-fan used in conjunction with a free-exit cowl, giving separate outlets for the airflow from the cylinder head and barrel finning.

The four-blade feathering airscrews are of 14ft 6in diameter and are de-iced electrically. Reverse pitch is fitted on all units and full power may be used for braking on all four engines. The reversing controls are such that it is impossible to brake with asymmetric power in the event of one unit failing to achieve reverse pitch. Fuel is contained in standard flexible crash-proof wing tanks and provision is made for pressure refuelling at 200 gal/min.

All the aerofoil surfaces are provided with internal ducting and there is a double-skin leading edge for thermal de-icing by petrol-burning heaters in the inboard wing leading edge and rear fuselage. Since full de-icing installations are not required in all climates, much of the equipment is removable, including burners. Cockpit heating is by a separate burner, and heat may be supplied to the freight compartment if desired. All de-icing and cockpit heating is controlled from the radio operator's seat.

The two main undercarriage units are of the fixed four-wheel-bogie type, the semi-cantilever shock-absorbers being the work of the Automotive Products Co., Ltd.

Performance figures have been obtained for the Mk 2 from full-scale flight tests on the Mk 1, and corrections made for the revised fuselage shape from wind-tunnel tests. The maximum weak-mixture cruising speed at take-off (127,000 lb) is 173 kt at 14,000ft.

The distance to take-off from rest to clear a 50ft screen at 127,000 lb is 1,210 yd, and the landing distance to rest from 50ft is 800 yd. This assumes zero wind, water/methanol injection, wheel brakes and braking airscrews.

Operating costs are given as 11.85 pence per ton nautical mile over a 250-mile stage-length with a load of 17.3 tons. These operational figures, have been calculated by the S.B.A.C. method.

ANGLO-U.S. CONFERENCE PROGRAMME

THIS year the Anglo-American Aeronautical Conference—organized alternately here and in the U.S.A. by the Royal Aeronautical Society and the Institute of the Aeronautical Sciences—is being held at Brighton during the week preceding the Farnborough Show.

It will begin unofficially on Sunday, September 2nd with the arrival of the first of the American delegates and their wives, and they will be joined by others, and by their British *confrères*, on the Monday, when a reception will be held during the early evening at the Grand Hotel.

On the Tuesday the conference proper commences with the opening addresses, and thereafter papers will be read as follows:

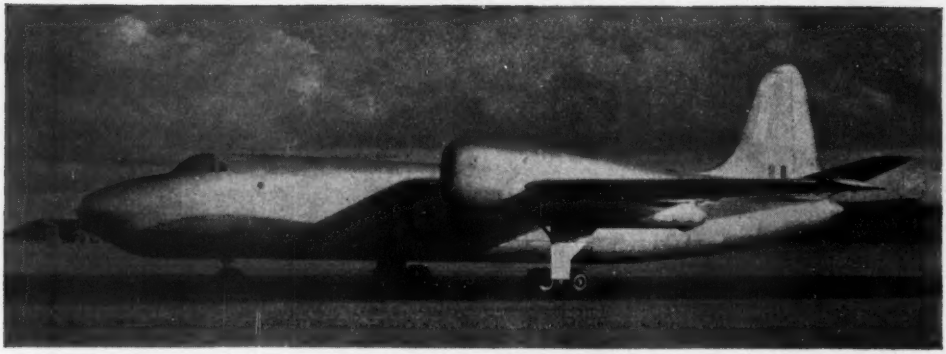
Tuesday, September 4th.—*Morning:* Aircraft Structural Design, by G. T. R. Hill. *Afternoon:* Infusion of Safety into Aeronautical Curricula, by Jerome Lederer; Flight Development of a Thick Suction Wing, by T. S. Keeble; Structural Problems in Future Aircraft, by Nicholas J. Hoff.

Wednesday, September 5th.—*Morning:* Problems of Turbine Transport Operation in Europe, by K. G. Wilkinson; Performance Characteristics of Jet Nozzles, by George S. Schairer; Propellers for High Powers and Transonic Speeds, by George W. Brady; Plastics and Plastic Structures, by J. E. Gordon. *Afternoon:* Reduction of Drag by Distributed Suction, by Sir Melvill Jones and S/L. M. R. Mead; High-speed Hydrodynamic Development, by Ernest G. Stout.

Thursday, September 6th. (*Lectures in morning only*)—Heat-transfer Studies Relating to Rocket Power-plant Development, by Louis G. Dunn; Some Aerodynamic Advances, by A. Fage.

Friday, September 7th.—*Morning:* Engineering Problems of Aircraft Operation, by B. S. Shenstone; Research into High-speed Flutter, by I. E. Ganik; Dynamic Stability and Control Research, by William F. Milliken, Jnr.; Experimental Deformations of Sweptwing Models, by A. H. Hall. *Afternoon:* Influence of Size on the Performance of Jet Engines, by S. J. Moyse and W. A. Pennington; Experimental Methods of Transonic Research, by John Stack.

Proceedings on the Friday afternoon will conclude with closing speeches by the presidents of the two societies, and in the evening the conference dinner will be held.



BOMBER FROM BELFAST: The S.A./4 bomber, powered by four Rolls-Royce Avon turbojets in paired, superimposed, installations, made its initial flight at Aldergrove, Northern Ireland, on August 10th. The pilot was Mr. T. W. Brooke-Smith, chief test pilot to the manufacturers—Short Bros. and Harland, Ltd., of Belfast. A crew of five is carried and it will be judged from this first view that the fuselage affords unusually generous stowage capacity. In company with the Vickers Valiant, similarly powered, the S.A./4 is scheduled to appear at the forthcoming Farnborough Display.

FARNBOROUGH IN PROSPECT

AS usual at this time of the year, work on new aircraft is being speeded with a view to showing, and in several instances, flying, them at the S.B.A.C. Flying Display and Exhibition at Farnborough from September 11th to 16th. About 20 types, most of them jet-propelled, will be making their debut. Military machines will include our newest intercepters, the Avon-powered Hawker P. 1067 and Supermarine Swift, and—entered in the "fast circus" by Armstrong Siddeley—a Sapphire-powered English Electric Canberra. The Avon-powered Mk 3 (photographic reconnaissance) version of the Canberra will also be represented. Distinguished by its pale-blue colouring, this model is 14 in longer than the Mk 2 tactical bomber and does not have the optically flat bomb-aimer's panel. Especially welcome among the military newcomers, in that they represent a class never before represented at a Farnborough display, will be the Vickers Valiant and Short S.A./4 jet bombers, each with four Rolls-Royce Avons. The research category will be strongly represented by no fewer than four delta-wing types (Avro 707A and B, Boulton Paul P. 111 and Fairey F.D.1) and the "scimitar-winged" H.P. 88. Flying test-beds will be fewer this year, but are likely to include an Avro Lincoln adapted for development flying with the Napier Nomad compounded engine. Numerous military and civil types will appear in their latest forms.

The first day of the show—Tuesday, September 11th—is reserved for a pre-view by technicians and the Press; the Wednesday is the official opening day, when attendance will be confined to guests invited individually by the S.B.A.C., as will also be the case on the Thursday and Friday. Members of the general public are particularly asked by the Society to save themselves fruitless journeys by noting that there is no public admission until Saturday and Sunday, the 15th and 16th.

Past experience suggests that the flying displays on these days, weather permitting, will be just as comprehensive and enthralling as on the "industry only" days; in addition, this year there is to be a special display of formation flying on the Saturday and Sunday by R.A.F. jet aircraft, as part of Battle of Britain Week.

A guide to admission prices and advance booking arrangements will be found on page 217.

"Flight" and the Show

As usual *Flight* will cover this notable event very fully, with special issues which will appeal both to those readers who for any reason are unable to visit Farnborough in person and to those who will be there but will be glad of a guide as to what to look for and—afterwards—a valuable souvenir and work of reference on current British aircraft.

On Friday, September 7th, our "Britain's Aircraft Industry" Special Number will appear, containing illustrated reviews of current British aircraft, engines and accessories. Special features will include a colour supplement illustrating the interior appointments of the de Havilland Comet as fitted to go into service with B.O.A.C. In addition, there will be a special pictorial feature of the greatest topical interest and value.

The following week's issue (September 14th), appearing during Show week, will include a full report on the aircraft in the "static park", among which some last-moment surprises will undoubtedly appear; and on September 21st we shall give a full story of the flying displays on both the "industry" and "public" days, together with critical observations on technical advances.

Each of these three issues will be particularly fully illustrated with *Flight* photographs and drawings. Additionally, a number of important conferences and lectures due to be held during the Show period will receive attention.

"BROOKIE" TELLS HOW: Officials of Short Bros. and Harland, Ltd., discuss the maiden flight of the S.A./4 jet bomber. (Left to right) J. C. Corlett, assistant chief works inspector; T. W. Brooke-Smith, chief test pilot; A. W. S. Clarke, chief engineer, and R. Beaney, assistant designer in charge of the S.A./4

BATTLE OF BRITAIN FLY-PAST

TO commemorate the eleventh anniversary of the Battle of Britain week (September 10th-16th) a fly-past of 280 R.A.F. aircraft has been arranged to cover London and provincial towns on September 15th. Two hundred jet-powered machines and 80 piston-engined aircraft will take part and will, as usual, be led by a single Hawker Hurricane, which is due to fly over Whitehall at 11 a.m.

The R.A.F., Royal Navy and U.S.A.F. will be represented by Meteors, Vampires, Lincolns, Washingtons, Thunderjets, Sabres, Sunderlands, Lancasters, and Sea Hornets. Speeds will be of the order of 150 m.p.h. and 360 m.p.h. for slow and fast types respectively, and the various formations will pass at one-minute intervals between 1,500ft and 2,000ft. They will then break up and fly over other towns before returning to their bases. Planning, co-ordination and control of the fly-past—constituting a major operation and forming a useful exercise—is in the hands of No. 11 Group, Fighter Command.

PRACTICAL EXPORT: This Percival Prince left London Airport last Friday (the new passenger building will be recognized in the background) for air-survey duty in Tanganyika. Several versions of the basic Prince are now in production at Luton, including the Sea Prince naval trainer and communications aircraft, and a number have been delivered. In all cases the power units are Alvis Leonides.

FROM ALL QUARTERS

Sabres on the Way

ARRIVAL of the first squadron of F-86 Sabre aircraft to be assigned to Europe, expected last Monday, was delayed by weather conditions on the Iceland route, and at the time of going to press the aircraft were due to arrive at Shepherd's Grove, Suffolk, last Wednesday, August 22nd. This squadron, which is part of the 81st Interceptor Wing, is expected to be reinforced by two more squadrons next month and will take part in a training programme with R.A.F. and U.S.A.F. heavy bombers. The 81st Interceptor Wing, which will remain in Britain indefinitely, is to be integrated into the overall Western Europe air-defence system under R.A.F. command.

Finnish Air Attaché Leaving

MAJOR BIRGER EK, one of the most popular of the foreign air attachés in London, is about to return to his native country, Finland, after a 3½-year tour of duty. He first came to Britain in 1939, as a member of the commission sent to accept Bristol Blenheim Is, ordered by the Finnish Air Force. He took one machine out to Finland himself in 1940 and also flew Bristol aircraft on operations during the Russo-Finnish war. Major Ek specialized mainly in anti-shipping and anti-submarine strikes and was awarded all three stages of the Mannerheim Cross. Before coming to London in the spring of 1948, he was Finnish air attaché in Stockholm for 3½ years. Among farewell calls he has made during the last few weeks was one on his old friends at Filton.

Sir John H. Woods Joins English Electric

FROM the English Electric Co., Ltd., whose aircraft division manufactures the Canberra, comes the announcement that Sir John H. Woods, G.C.B., M.V.O., Permanent Secretary of the Board of Trade since 1945, is shortly taking up an appointment with the Group.

Sir John H. Woods

Sir John's career has been a brilliant one that has covered over 30 years in the Civil Service from the time he entered the Treasury as an Assistant Principal in 1920. He has been secretary to the Trade Facilities Act Advisory Committee, Principal Private Secretary to the Chancellor of the Exchequer, and a Principal Assistant Secretary in the Treasury from 1940-43. From 1943 to 1945 he was Permanent Secretary to the Ministry of Production.

Born in 1895, and educated at Christ's Hospital and Balliol College, Oxford, he served in France with the 22nd Battalion of the Royal Fusiliers during the First World War, and was invalided out of the Army as a result of wounds.

Mr. Henderson in Canada

IT was announced in Ottawa last Monday that Mr. Arthur Henderson, Secretary of State for Air, was due to arrive in Canada yesterday for a week's visit. Accompanied by Air Chief Marshal Sir Leslie Hollinghurst, he is to visit aircraft factories and R.C.A.F. stations.

Control Officers' Pay Protest

AT the end of last week there were signs that, unless some speedy action is taken on the part of the Treasury, approximately 400 air-traffic control officers at London and Northolt airports and at A.T.C.C., Uxbridge, would consider enforcing an immediate "work to rule" policy. The A.T.C.O.s, 75 per cent of whom are ex-pilots, are paid on a scale ranging from £430 per annum at the age of 25. A recent offer by the Treasury of a 10 per cent increase was rejected by them.

Italian Interest in Leonides

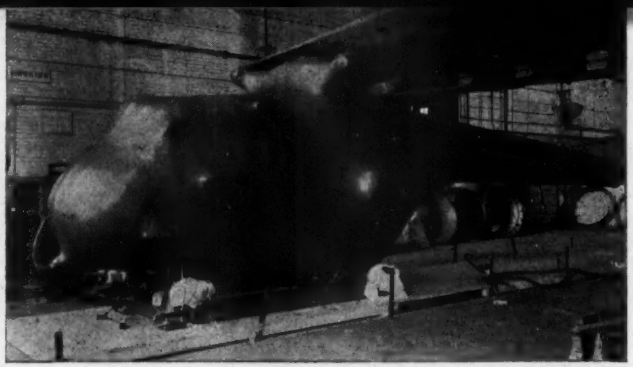
ALTHOUGH no official announcements have been made by either party, important results may follow a visit paid on August 16th to the Coventry works of Alvis, Ltd., by Col. D. S. Fanali, the retiring Italian air attaché, and his successor, Col. C. F. de Porto. Discussions were held with Mr. J. J. Parks, managing director. Italy is known to be interested in the Leonides engine for trainer applications, and an agreement for the Fiat company to build these units in Italy may be sought. The two colonels flew in the Leonides Consul "test-bed" at Baginton with Mr. J. Williams, the firm's test pilot.

W/C. Powell for Lockheed Brake Co.

MANY who knew him during and since his Service career will be interested to learn that W/C. Harry Proctor Powell, A.F.C., A.R.Ae.S., has joined the Lockheed Hydraulic Brake Co., Ltd., Leamington Spa. His duties will be concerned with promoting closer liaison between the company's aircraft division on the one hand and the aircraft industry and Service aviation on the other. W/C. Powell served in the R.A.F. from 1936 to 1945, and was a test pilot at Boscombe Down from 1941 to 1943. Then he was assistant commandant at the Empire Test Pilots' School for three years, chief test pilot to Air Service Training, Ltd., for two years, and subsequently chief test pilot to Percival Aircraft. From that post he went to the Dunlop aviation division, for whom he completed 18 months' test flying; then, feeling an inclination to take a more direct interest in the commercial side of aviation, as distinct from flying, he secured his appointment with the Leamington company.

W/C. Harry Powell

HERE AND THERE



NO ELEPHANT CARCASE imported by the Ministry of Food to supplement the meat ration, but a Ministry of Supply "export"—a Bristol 171 helicopter "Cocooned" for despatch to Canada, where it will undergo winterization trials. Another was recently flown to Khartoum—in a Bristol Freighter—for tropical tests. The wing visible above the 171 belongs to a Freighter.

Canadian Royal Aircraft

DURING the forthcoming visit to Canada by Their Royal Highnesses Princess Elizabeth and the Duke of Edinburgh, it is probable that the Canadian Government will place at their disposal the R.C.A.F. Canadair furnished for the exclusive use of Royalty and V.I.P.s.

Sabre's Closed-Circuit Record

SUBJECT to confirmation, a new 100 km closed-circuit record of 628.508 m.p.h. was established at Detroit on August 19th by Col. Fred J. Ascani in an F-86 E. The record has been held since April, 1948, by John Derry (D.H. 108) at 605.23 m.p.h. Last week-end, also, competing in the transcontinental Bendix Trophy Race, Col. K. K. Compton flew an F-86 E 1,920 miles at a speed of 556.37 m.p.h.

International Parachute Contest

SINCE the photograph of the British parachute team (on the following page) went to press, the results of the international contest at Bled, Jugoslavia, have come through. It appears that the Britons, though they put up an excellent performance, were unlucky; "Chuck" Thompson was disqualified in the delayed-drop event by falling from 6,500ft to less than the minimum safety-height (1,000ft) before pulling his rip-cord. Maj. "Dumbo" Willans was fourth in the overall contest, after gaining top marks for a precision jump and a delayed drop in the final contest, in which the competitors had to descend into a lake, free themselves from their harness, and swim ashore. Willans lost time while freeing himself. The overall winner was Pierre Lard, of France.

Cheaper Atlantic Crossings?

"TWO-CLASS" North Atlantic travel has been foreshadowed before, but it is not without interest that the latest mention of its possibilities comes from Mr. A. E. Russell, B.Sc., F.R.Ae.S., F.I.Ae.S., the designer of the Brabazon, who has been on a visit to Canada. He spoke of its practicability in a recent interview at Montreal.

"Bournemouth" Trips up

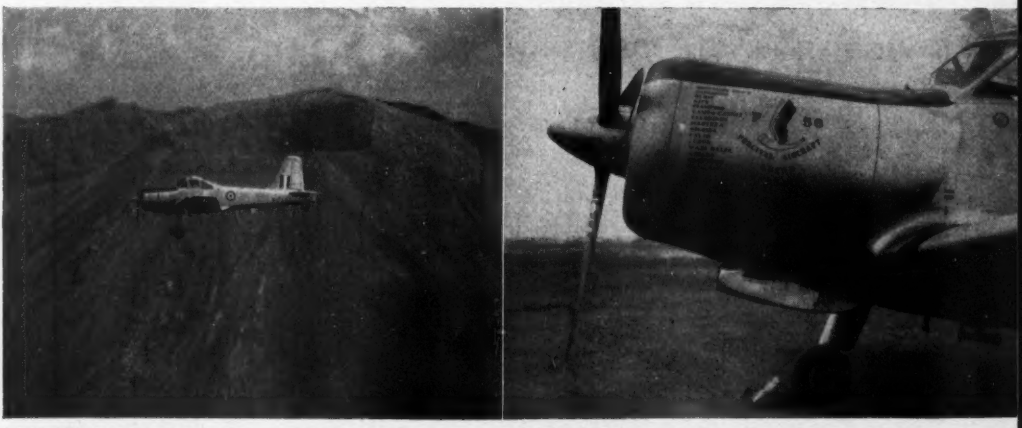
RETURNING from her third flight—of 34 minutes' duration, from the R.A.F. Balloon Centre at Cardington on August 16th—the Airship Club's non-rigid dirigible *Bournemouth* met with a minor mishap. A guy-rope entangled itself in the roof of one of the station buildings and the car was drawn into contact with the structure, suffering some damage and breaking the airscrew. On board were Lord Ventry, chairman of the Club; S/L. T. P. York-Moore, pilot; Arthur Bell, flight engineer; and F/L. H. Richardson. After deflating the 45,000 cu ft envelope, the handling party were able to get the aircraft safely down. The *Bournemouth's* first flight was made at Cardington on July 19th; it was uneventful, though the ship proved rather stern-heavy.

Dollars per Rev

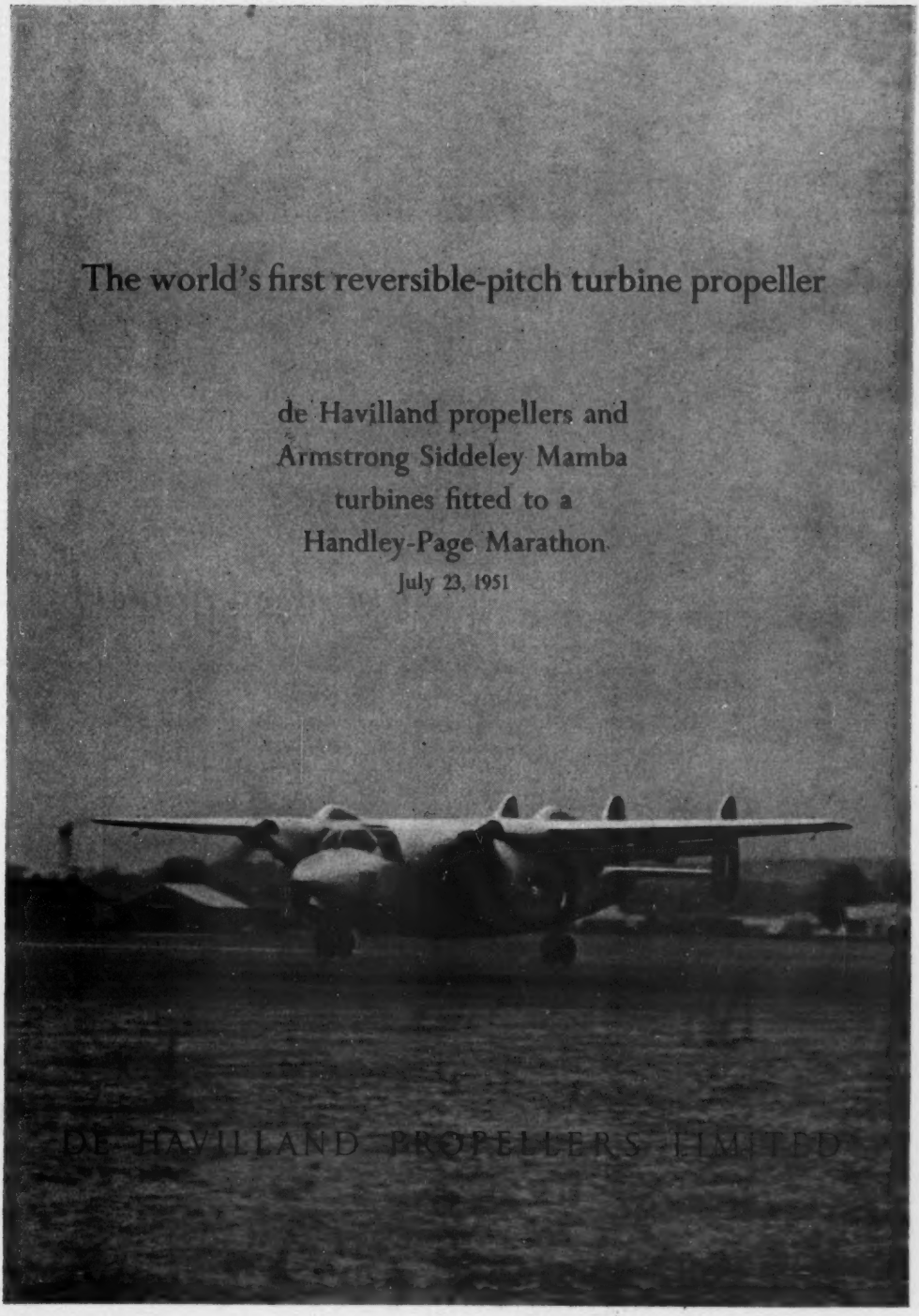
OPERATION of Convair B-36 bombers seems to be an expensive business, for more reasons than one. According to *Aviation Week*, the annual replacements bill for one aircraft is about two million dollars, the major portion being spent on the power units. For the piston engines, P. and W. R-4360s, the U.S.A.F. makes a replacement allowance of 101 per cent, and for the podded turbojets, General-Electric J-47s, 89 per cent. The fly-away cost of a new B-36 is estimated at 3½ million dollars.

Perring Memorial Fund Opened

THE colleagues of the late Mr. W. G. A. Perring, who was director of the R.A.E. at Farnborough, have decided to open a memorial fund as a tribute to him. Though it has been decided that the memorial shall be of a kind which will benefit the largest



HOME AGAIN: Two Percival Provosts, one with Leonides engine and the other with Cheetah, recently returned after a successful session of tropical trials in North Africa from May 28th to July 5th. Take-off, landing and cooling tests were carried out at Nairobi and Khartoum. The distance to Khartoum is 3,274 miles, and Nairobi is an additional 1,144 miles. The total flying time for the two aircraft was 211 hr 40 min. Among the party of ten from the industry and Services, were the pilots, S/L. D. White, D.F.C., and F/L J. Castagnola, D.S.O., D.F.C., both from the A. and A.E.E., Boscombe Down. On the left, the Provost is seen flying near the crater of Vesuvius; on the right are listed the places visited.


The world's first reversible-pitch turbine propeller
de Havilland propellers and
Armstrong Siddeley Mamba
turbines fitted to a
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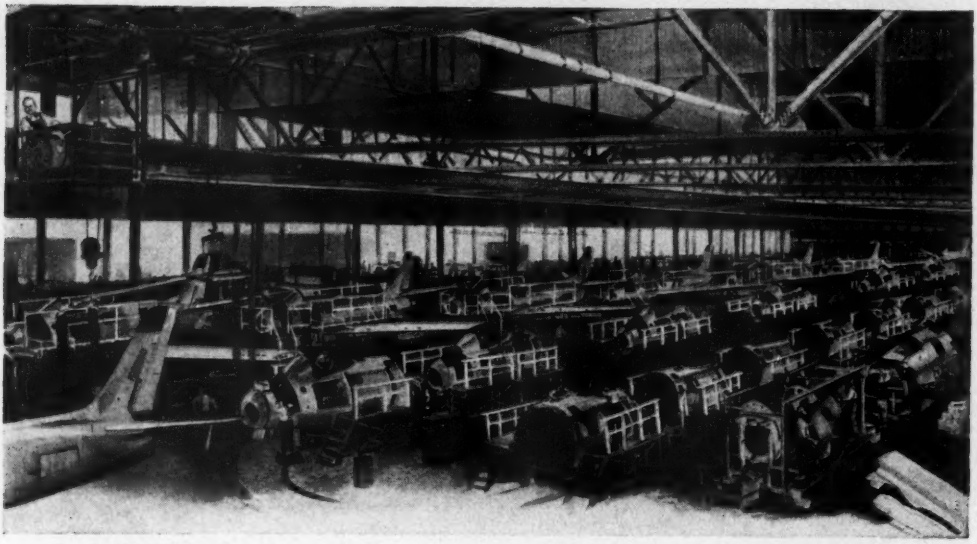
July 23, 1951
DE HAVILLAND PROPELLERS LIMITED

C



A portion of the F-86 assembly area, Plant 2, Canadair Limited, Montreal, Canada.

CAPACITY TO BUILD - Thousands of planes!

Moving steadily through thousands of separate manufacturing steps in 40 acres of modern factory space . . . passing along more than two and a half miles of assembly flow lines . . . through the hands of thousands of skilled Canadian workers . . . F 86 Sabre* jets are rolling out for delivery at Canadair.

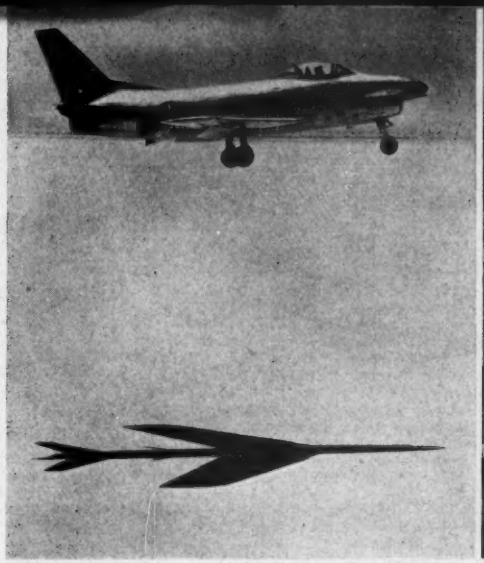
From preliminary design to final assembly, Canadair is equipped to produce every type of military and civil aircraft. The plants at Canadair, with their adjacent runways, stand high among the most modern aircraft manufacturing facilities in the entire world. We welcome enquiries regarding the design and manufacture of any type of aircraft.

For further information:
European Representative, J. H. Davis,
Princes House, 190 Piccadilly, London, W1, England.

Vignettes of
CANADA—AIR LAND
Aircraft manufacturing history in Canada goes back a long way to a day in September 1907, at Baddeck, Nova Scotia . . . when the Aerial Experiment Association was formed by Dr. Alexander Graham Bell, J. A. D. McCurdy (presently the Lieutenant Governor of the Province of Nova Scotia), F. W. Baldwin and others. In the "Silver Dart" — built by the Association — McCurdy made the first successful flight within the British Empire and Baldwin, in the "Redwing", was the seventh man in the world to fly an aircraft.
Since those early adventurous days, Canadian aircraft production has increased beyond the wildest dreams of the pioneering airmen of Baddeck. Today, Canadian aircraft manufacturing companies are designing and quantity-producing some of the world's finest aircraft . . . built by skilled Canadian labour.

Canadair
LIMITED. MONTREAL, CANADA

*Made under license from North American Aviation, Inc.



SWEPT SHADOW: The prototype F-86D casts a plan-form shadow on the dry lake bed at Muroc, as it comes in to land at Edwards Air Force Base.

THE VIKING ROCKET leaves its White Sands launching site for its record 135-mile climb on August 7th (see page 188 of "Flight" last week).

HERE AND THERE . . .

possible number of people, its form has not been finally decided. Dr. W. Cawood, at the R.A.E., is chairman of the committee, and Mr. J. Wilson is the treasurer.

And Who Better?

MR. WINSTON CHURCHILL is to make an appeal on behalf of the R.A.F. Benevolent Fund in a B.B.C. broadcast at 8.25 p.m. (Home Service) on Battle of Britain Sunday, September 16th. He is vice-president of the Fund.

U.S. Canberra Wing Contract

A CONTRACT has been signed between the Glenn L. Martin Company, Baltimore, Md., and Kaiser Metal Products, Inc., of Bristol, Pa., whereby the Kaiser company will manufacture wings for the U.S.A.F. Canberras. The value of the contract is said to be "very large." Glenn Martin already have some 3,000 sub-contractors.

FARNBOROUGH FACTS

FOR the guidance of intending visitors to the S.B.A.C. Flying Display and Exhibition on the "public days" (Saturday and Sunday, September 15th and 16th) the essential facts are: Admission: Pedestrians 3s; children (under 16) 2s; cyclists 4s. Vehicles: Motor cycles 2s (riders at pedestrian rates); combinations and three-wheelers (with occupants) 10s; cars (with occupants) 20s; coaches (with occupants) £5; double-decker buses (with occupants) £10. Reserved enclosure 10s per person extra (children 5s). Advance bookings are handled by Auto Parks, Ltd., 1, Maclise Road, London, W.14. (Shepherd's Bush 5385.)

The S.B.A.C. informs us that there will be no restrictions on the normal use of cameras by the public.

BALE-OUT TRIO: The team of parachutists which is representing Britain at the international parachute-jumping competition at Bled, Jugoslavia, photographed on leaving Northolt last week. Left to right: Maj. Terence ("Dumbo") Willans, Charles ("Chuck") Thompson and John Fricker. The last is the captain of the team and will pilot the aircraft from which his colleagues jump. All three are well-known performers at air displays. Last year Maj. Willans made a 6,000 ft. delayed drop, using an Irving barometric release.

IN BRIEF

MR. BERNARD HOPPS has retired from the managing directorship of Lodge Plugs, Ltd., a post which he has held for the past 38 years. He will continue to act as chairman and as technical director. Mr. F. M. Sayers will be responsible to the board for the management of the company.

* * *

Extrusions in Hidominium is the title of a large 114-page brochure published in ultra-modern format by High Duty Alloys, Ltd., Slough, Bucks. Its compilers have succeeded handsomely in combining with the attractive appearance very complete technical data and an efficient quick-reference system.

* * *

Mr. F. A. Gannon, a principal of Allison Gray and Co., Australian representatives of Handley Page, Short Bros. and Harland, Blackburn and General Aircraft and a number of aircraft-component firms, leaves Sydney next week on a two-month business visit to Britain. He may be contacted at his company's London office, 5, Broad Street Place, London, E.C.2.

* * *

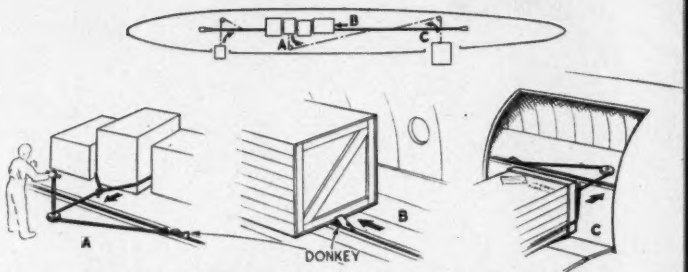
Many of the veteran aircraft shown at Hendon recently were fitted with their original Palmer tyres and wheels; they dated from a time when Palmer held a monopoly in this field. Two of the machines which flew—the Blackburn monoplane and the Sopwith Pup—had their original wheels with tyres at least 15 years old. The wheels were of the wire type, faired by canvas covers.

* * *

Mr. Howard Thompson, chairman and managing director of Thompson Bros. (Bilston), Ltd., has been elected national president of the Institute of Welding. He is president of the Wolverhampton branch of the Institute, of which he was the first chairman when it was formed in 1945. Thompson Bros., whose refuellers and other products are well known in aviation, have been concerned with metal fabrication and welding since 1880.

CARGO HANDLING

Special Applications Developed in America for Air Transportation



(Above) This diagram indicates the operational sequence of loading or unloading freight by means of the submerged floor unit. Two types of "donkey" are shown. (Below) The Aero-Trusty conveyor, installed in a mock-up of the Lockheed 1049 Super-Constellation, shows the ease with which boxed freight may be moved in all directions.

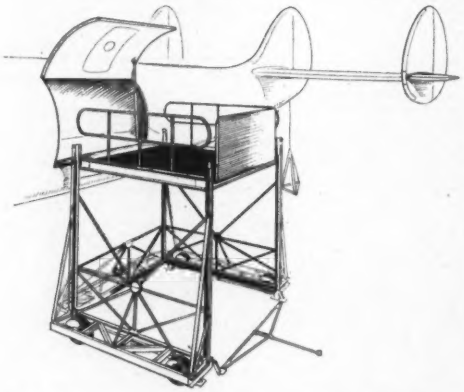
THE study of mechanical handling techniques during the last decade has received considerable attention, and goods-moving equipment has reached a stage far beyond that of mere gadgetry. Although industry in the United States has for some time recognized the commercial advantages offered by efficient handling techniques, there are clear indications (as exemplified by the London exhibitions organized by our associated journal *Mechanical Handling*) that Britain is now well abreast of developments in this field and can no longer be classed as a beginner.

Fair recognition, however, must be accorded to a serious attempt made by an American aircraft constructor, the Lockheed Aircraft Corporation, to simplify and expedite the handling of air freight, both externally and internally.

A demonstration was recently given at Burbank, California, of the "Aero-lift," which elevates the freight to the loading entrance, and the "Aero-Trusty conveyor," which manipulates the cargo inside the aircraft.

To describe the last first, since it is the more interesting of the two, the Aero-Trusty conveyor is a submerged integral floor unit which extends the length of the aircraft cargo compartment. The principal item is a light-alloy extrusion which either replaces or is attached to the central longitudinal floor member. At each end of the track is a flush sprocket housing, one for the conveyor sprocket drive and the other for an idling sprocket. An endless chain passes over the drive and idling sprocket, and is contained within the extrusion in the horizontal plane. The reversible electric power unit is portable, being attached to the drive sprocket assembly by means of a pad and flange.

A control unit of the automatic extension-reel type is provided for the operator. To attach the boxed freight to the conveyor a claw device known as a "donkey" (see illustration) is used, which engages the chain drive and moves on rollers inside the submerged extrusion. To prevent jamming when the unit reaches the limit of its travel, provision is made for ejecting the claw by means of a ramp in either sprocket housing. Portable pulleys, suitably located and held to the floor, permit the movement of cargo in all directions. The chain exerts a pull of 4,000 lb, capable of moving loads up to 10,000 lb. The complete unit adds 269 lb to the aircraft weight, but this can be reduced to 117 lb by flying without the portable items.



The mobile cargo elevator, which is capable of lifting 10,000 lb to a height of 10ft. This unit may be dismantled and flown in the aircraft itself to advanced airstrips.

The Aero-lift is a mobile elevator which is used for elevating freight to the height of the cargo floor. It consists of a light-alloy framework, which has four vertical stanchions and a 10ft by 10ft loading platform. The platform is supported at the corners by four cables, which pass over the stanchions and are connected to an electric winch mounted on the frame. By this means a load of 10,000 lb may be raised to a height of 10ft. When in operation, the structure stands on four manually operated jacks. Flexible ramps permit the freight to be wheeled on to the platform and into the aircraft. The complete unit weighs 1,800 lb and requires 175 cu ft stowage space.

Both units have the advantage of being powered by the aircraft 24-volt electrical supply, and can be carried in the hold for use at distant airfields.

Manufacturing rights have been contracted to the Weber Showcase and Fixture Co., formerly the Airquipment Co., a Lockheed subsidiary.

Other handling equipment developed by Lockheed includes a mobile telescopic gangplank and assorted baggage trucks.

BRITAIN'S MIDDLE-EAST AIRLINE

Cyprus Airways: The Work of a Small, Happy and Efficient Organization

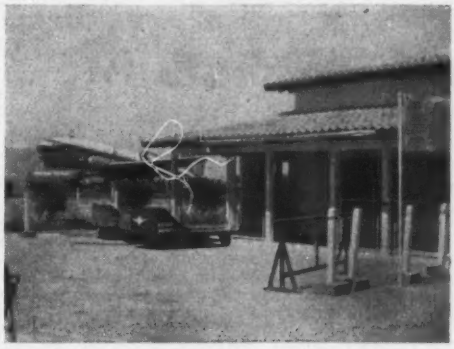
A LARGE proportion of the countless tourists who, seeking sunshine and tranquillity, visit the British island of Cyprus, is carried in the DC-3s of Cyprus Airways Ltd., a subsidiary of the British European Airways Corporation. This industrious little airline which, unlike so many of its contemporaries, is now running at a profit, has been in operation since September 1947. In the early days, flights were made under a charter arrangement, using three of B.E.A.'s Dakotas on a twice-weekly schedule to Athens, Beirut, Lydda, Alexandria and Cairo, with a weekly service to Istanbul. The location of Cyprus is, of course, ideal for the purpose of showing to advantage the benefits to be derived from air travel, and passenger and freight traffic has increased steadily since the early days. Today, Cyprus Airways' original paid-up capital of £125,000 has been enlarged to £185,000, of which a controlling interest of 55 per cent is held by the Cyprus Government and by private citizens; B.E.A. and B.O.A.C. are joint participants in the remainder.

In the company's first year, operations were conducted at a small loss, but in 1950 a profit of £17,478 cleared the deficit. The results for 1950-51 also showed a profit of nearly £1,000, in spite of devaluation of the pound sterling. But for the effect of devaluation on the company's revenue traffic, increases would have effected a handsome improvement on the previous year's results.

Much of the success of Cyprus Airways, writes a correspondent who has recently returned from the island, undoubtedly springs from its being a small, friendly company where everyone knows everyone and regulations and red tape are at a discount. There is no need for a top-heavy overhead organization, and, indeed, no opportunity for one, to build itself up. This fact is apparent in the genuinely happy atmosphere at all levels. The company has its administrative offices in Nicosia, the capital, the aircraft being based at Nicosia Airport. This is an R.A.F. airfield, situated about five miles from the town, and on a plateau that affords excellent approaches on all three runways.

The civil side of the airport is managed by Cyprus Airways on behalf of the Government, and a number of attractive and practical buildings have been provided. From the passenger-handling viewpoint the facilities are simple yet effective. The Customs hall and passenger waiting rooms are housed in low, cream-painted buildings with red Roman-tiled roofs, and the whole layout has an attractive border of semi-tropical shrubbery. A great saving of space and time has been achieved by making the surrounding verandahs do duty as departure and arrival channels, with desks for the officials situated between them. Even so, traffic is already—

"Citiun," one of the five DC-3s which comprise the Cyprus Airways fleet.



A glimpse of Nicosia Airport from the end of the Customs Building.

as is the case at many airports the world over—too great for capacity.

In addition to M.F., H.F., and V.H.F. radio facilities S.B.A. is available, although the only bad visibility throughout the year is brought about by occasional morning ground mist. Rain clouds seldom bring the ceiling below a couple of thousand feet, and, in fact, regularity last year was 99.5 per cent.

Cyprus Airways rents from the R.A.F. a war-torn Bellman hangar and some simple huts for use as stores and workshops. These latter buildings, originally crude in design and without double roofs, have been made into exemplary premises of unusual neatness and efficiency by a process known in the R.A.F. as "self-help" (i.e., making what you cannot buy). Complete airframe maintenance is carried out, including progressive C. of A. and major structural repairs or modifications. Hydraulic components, instruments and radio are tested and repaired, but engines and airscrews are at present, returned to this country. Being so far from a main supply source, spares stocks are larger than would otherwise be held.

The technical side comes directly under the company's chief pilot, Capt. J. B. W. Pugh, whose aircrew, unlike the other British personnel, are seconded from British European Airways. The pilots are at present averaging about 1,000 hours a year.

Total aircraft utilization at 1,200 hr a month, is not startlingly high, but the management feel this to be a critical figure. For maintaining and flying the five Dakotas at present used there are seventeen British licensed aircraft engineers—in addition to semi-skilled and unskilled local staff—and six complete aircrews. An increase in utilization would mean a considerable increase in staff, because they would have to work in shifts; thus it would be uneconomic until business had greatly increased.

Larger loads are expected, however, and these will at first be catered for by converting the present 21-seat cabins into 28-seat versions, on the lines of B.E.A.'s Pionairs. An extra DC-3 is also being acquired. The present overall revenue load-factor is more than 60 per cent and about 17,000 passengers travelled with the airline last year. With the present fleet, services are now operated at the following frequencies: Athens, four times weekly; Beirut and Lydda, thrice weekly; Rome and Cairo, twice weekly; Jerusalem, Alexandria, Ankara/Istanbul, Haifa and Khartoum, weekly; and Bahrein fortnightly. The board of Cyprus Airways is under the chairmanship of Cdr. B. Wolfson, O.B.E., V.R.D. (of B.E.A.), executive control being in the hands of W/C. J. Vick, who was previously with B.O.A.C.

FLIGHT-TESTING at FARNBOROUGH

The Day-to-day Work of an Important Section of the R.A.E.

APART from subsequent references in lectures when results have been analysed, flight-research work at the Royal Aircraft Establishment, Farnborough, naturally receives little publicity. This brief review of the day-to-day work of what is known as the Aero Flight gives some measure of the responsible and valuable duties of the pilots and scientists concerned. We reprint it, with acknowledgment and in slightly abbreviated form, from the July "R.A.E. News." The author is Mr. Handel Davies, M.Sc., F.R.Ae.S., I.Ae.S., who is in charge of the work. Readers may recall his R.Ae.S. lecture, "Some Aspects of Flight Research," (see "Flight," February 23rd and March 2nd.)

IT is now almost half a century since aircraft first began to be tested in flight on Farnborough Common. In those early pioneering days flight testing consisted largely of attempts to determine whether the aircraft would leave the ground. We have advanced a long way since then, but in aeronautics, perhaps more than in any other branch of engineering, the more knowledge we gain the more remains to be learnt; and, in spite of all the developments which have taken place in wind tunnels and other research techniques, there are still many questions which can be answered only by making measurements and observations in flight. This has become even more evident during the last few years whilst we have been probing into the unknown and hazardous regions near the speed of sound, since flight at these speeds has brought many new problems which can only be fully investigated in flight, and the effort to penetrate the so-called "sonic barrier" has led to many unorthodox trends in design.

The investigation of such problems in flight and the testing of advanced aircraft at the R.A.E. is mainly the responsibility of the Flight Section of the Aero Department.

Perhaps the best example which can be taken to illustrate the nature of this work is provided by the tests which are frequently made to investigate and improve the stability and control characteristics of an aircraft, i.e., the way in which the aircraft handles and behaves under all conditions of flight. For this purpose measurements are made of elevator, aileron, rudder and corresponding trimmer angles, and of the force which the pilot exerts on the control column, under different conditions of flight and during various manœuvres. The speed, altitude, and the amount of g to which the aircraft is subjected are measured at the same time, as well as, perhaps, rates of roll and yaw, and any other quantities which it may be necessary to determine in the particular test concerned. These measurements are usually made by means of an automatic observer, i.e., by photographing a panel of instruments mounted somewhere inside the aircraft, or by recording the measurements directly as a continuous trace in a multi-channel electronic recorder. The correlation of these measurements, with the pilot's impressions of the behaviour of the aircraft, forms, of course, an important part of the work.

In most cases it is necessary to extend such measurements to the highest speeds which can be attained in steep dives, and speeds in the neighbourhood of the speed of sound are often reached in this way. Under these conditions shock waves form on the wings, fuselage and tailplane of the aircraft, often resulting in highly dangerous behaviour, such as a tendency rapidly to increase the angle of the dive and for the controls to become completely ineffective. One of the main objectives of these tests is to try to understand the precise reasons for these effects so that they can be eliminated or at least reduced on future designs. The shock waves themselves are sometimes "photographed" in flight as part of the effort to understand their nature and characteristics.

Similar tests are also made to measure the drag of aircraft at high speeds and to investigate the very rapid increase on drag which occurs on all aircraft as the speed of sound is approached.

At the other end of the speed range tests are made to investigate the spinning and stalling characteristics of aircraft. Measurements may also be made of take-off and landing runs. and the effect of different types of landing flaps and other devices investigated.

Going even further down the speed range, a considerable amount of flight testing is done on helicopters. The Westland-Sikorsky S-51, the Bristol 171 and the Bell 47 are among the helicopters which have been tested during the last few years.

Some standard aircraft such as Meteors and Vampires, and even Lancasters, modified in some way to investigate a particular development, are still used in the course of the work of Aero Flight, but there has been an increasing tendency to concentrate on special experimental aircraft built specifically for research purposes. The Hawker 1052, the Supermarine Swift, the Boulton Paul Delta, and the all-wing Armstrong Whitworth 52 are typical examples of such aircraft, and they have all undergone test in Aero Flight. Sometimes standard aircraft are used in order to provide a means of doing more or less fundamental research. For example, a Vampire is at present being used to measure the forces on small models mounted in the region of transonic and supersonic flow on the wing surface, thus providing an alternative to a transonic wind tunnel. Vampires have also been used to develop methods of photographing shock waves in flight, and to investigate the characteristics of the boundary layer on the wing at high speeds.

[Mr. Handel Davies concludes with a tribute to the skill of the pilots, mentioning the award of the Air Force Cross to the Flight Commander, S/L. Smyth, who made the first flight in the Boulton Paul Delta; he also names Lt. Elliott, R.N., the only other pilot to have flown this particular aircraft, who has carried out much of the R.A.E.'s high-speed testing during recent years. He praises, too, the aircraft-maintenance staffs, and particularly the personnel of "C" Shed under Mr. Froud.—Ed.]

INTERPLANETARY CONGRESS

ARRANGEMENTS for the Second International Congress on Astronautics are now complete and the main proceedings will be held in Caxton Hall, Caxton Street, London, S.W.1, from September 3rd to 8th. Working sessions will form the first part of the Congress and will be open to delegates only. The technical session, which forms the second part, will be open to the public and the following papers will be presented:

Thursday, September 6th (10 a.m. to 1 p.m.).—Importance of Satellite Vehicles in Interplanetary Flight, by Dr. W. von Braun; Applications of Satellite Vehicles, by Birch Andersen; lecture, title not specified, by Ing. G. von Pirquet. *From 2.30 p.m. to 5.30 p.m.:* Ascent of Satellite Vehicles, by D. F. Lawden, M.A.; Descent from Satellite Orbits using Aerodynamic Braking, by T. R. F. Nonweiler, B.Sc.; Ascent of an Earth-Satellite Vehicle, by Ing. Janzon; Start, Return, and Landing of an Optimum Satellite Step Rocket,* by Dipl. Ing. H. Kuhme.

Friday, September 7th (10 a.m. to 1 p.m.).—Optimum Satellite Freight Rocket,* by Ing. H. Hoeppner; Meteor Hazards to Space Stations, by M. W. Ovenden, B.Sc.; Design Problems of Space Stations, by H. H. Koelle; Optimum Orbit of a Space Station for Radar Tracking,* by Dr. R. Merten; Landing of Space Craft, by E. V. Sawyer. *From 2.30 p.m. to 5.30 p.m.:* How the Space Station may be Constructed, by Dipl. Ing. R. Nebel; Orbital Rendezvous Problems, by R. A. Smith; Minimum Satellite Vehicles, by K. W. Gatland; Construction—Proposition Space Station,* by Ing. A. Pullenberg.

Saturday, September 8th (3 p.m. to 6 p.m.).—Technical Symposium.

* *These papers will be read in German.*

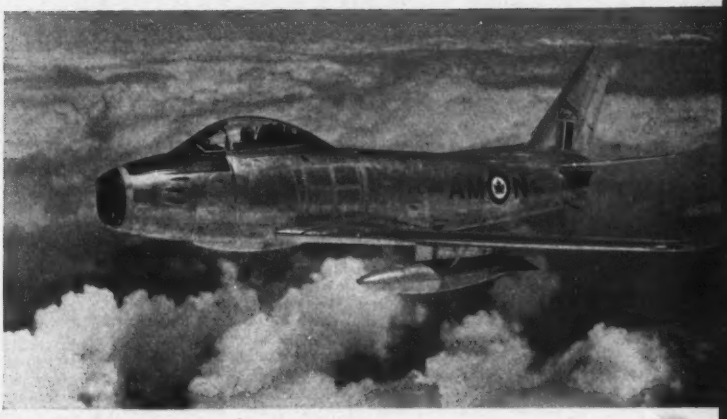
R.Ae.S. ASSOCIATE FELLOWSHIP EXAMINATION

THE Royal Aeronautical Society announces the following names of candidates successful in the associate-fellowship examination held last May:—

Part I.—W. J. Avis, D. S. Bliss, R. Bocock, I. F. Burns, H. A, Buchholdt, F. J. Butters, R. P. Francis, L. J. Geering, J. F. G. Hart. I. Harwood, R. H. Hayward, A. J. Heath, R. Lewis, C. Mullen, C. L. Munro, J. M. O'Connell, N. H. Simmonds, W. A. Page, F/O. D. W. Scott, M. D. Bernard-Smith, P. C. G. Stalkartt, M. K. Thein, D. Ross Turner, E. C. Turner, J. D. Watkins, D. Wood; P. Krishna-Iyer (examination taken in India).

Part II.—J. A. H. Bailie, G. H. A. Fenton, J. D. Mann, L. F. Nicholls, R. C. L. Sample, M. J. Taylor, D. W. Wall, E. G. Wilkinson.

NEWS IN VIEWS



SABRE GUINEA PIG: An F-86 of No. 410 (Cougar) Squadron, R.C.A.F.; it was used to establish loading and stowage procedure on H.M.C.S. "Magnificent", the carrier that is to bring the unit to Britain this autumn. The Sabres will be loaded and off-loaded by crane.

IN ENGLAND NOW: Members of the Turkish Air Academy, touring Britain, are seen here with their escorting R.A.F. officers during a visit to the Gloster Aircraft factory. In the centre, in light uniform, is Lt.-Gen. Feozi Menjuc and on his left is Brig.-Gen. Amiz Turkay, Commandant of the Academy.

E.P.T.S. OUTING: Pilots attending No. 10 course at the Empire Test Pilots' School visited the Boulton Paul factory at Wolverhampton, to inspect recent developments in power-operated controls and electronic research equipment.

TO WHAT BASE USES: A line of Fairchild C-119s in Japan. They carry troops or stores to the front and return with sick and wounded. Some comment, however, has been made as to their suitability for such duties owing to the length of take-off run.

IRAQI VISITOR: Emir Feisal, Saudi Arabian Foreign Minister, has been staying in Britain for the past ten days. During a visit to Biggin Hill, he and his entourage were invited to inspect a Chipmunk by Raidh Khadhiri, an Iraqi officer training in Britain.

THE BLITZ in PERSPECTIVE

A Revealing Analysis of the Luftwaffe's War on Britain

Reviewed by B. J. HURREN

THERE is much to be said for the journalist who, to attract attention to an article on recruitment, entitled it *There's a Horse in the Kitchen*. In an age pap-fed on sensationalism, such a title has much to commend it. Conversely, a new Government publication, of considerable interest to the air world, bears the forbidding title *Problems of Social Policy*;* but it is, in fact, one of the most fascinating books yet written about the bombing of Britain.

The story begins in the early twenties, when an analysis of German raids during 1917-18 is quoted. Then, about 300 tons of bombs were dropped on the British Isles; they caused 4,820 casualties, of whom 1,413 were killed. The casualty ratio was therefore 16 per ton of bombs; but 128 aeroplanes raided London, and on the only two day raids the ratio was 121:1, while for the 16 night raids it was 52:1. The Air Staff therefore assumed 50 casualties per ton—one third killed, two-thirds wounded.

Lord Balfour, in 1922, pointing out that the worst German raid involved only three tons of bombs, predicted that a Continental enemy could drop on London a "continuous torrent" of high explosives at the rate of 75 tons a day.

By 1934, the Air Staff had a second think; and they calculated that by 1942 the maximum daily weight of bombs on Britain would be 150 tons. That was Hitler's first year of power. In 1937, a drastic revision of estimates put the potential German air effort at 644 tons for a 24-hour period. Two years after that, in March 1939, the Air Ministry informed the Ministry of Health that the attack might average 700 tons each day for the first fortnight.

Incidentally, the Air Raid Precautions Department based civil defence on 50 per cent high explosive, 25 per cent incendiary, and 25 per cent gas attack. The chief target would be London, with 9,000,000 people packed in 750 square miles.

The scale of the headache in Whitehall may well be gauged from the fact that evacuation of civilians from "hot" zones was planned for 4,000,000 people, mainly women and children—equivalent to evacuating all Denmark, or Finland, or Norway. On September 1st 1939, the evacuation plan was put into effect: and in three days no fewer than 1,473,000 mothers, children, teachers and escorts were moved from crowded cities without a single accident or casualty. Between June and September, 1939, it is estimated that 2,000,000 other people moved privately to "safe" areas, and half of this number had earmarked accommodation at least seven months before the outbreak of war.

On September 7th 1940, the great air attack on London and other crowded cities began. The monthly average was 1,870 enemy aircraft from September 1940 to May 1941; but thereafter the scale of attack lessened progressively to 101 aircraft in December 1941.

Hitherto, the bombing had been desultory. For the record, the first bomb dropped on the British Isles fell at Hoy, Orkneys, on October 17, 1939; the first civilian casualty was at Bridge of Wraith, Orkneys, March 17th 1940; the first "incident" in England was on April 30, 1940, when an enemy mine-laying bomber crashed at Clacton-on-Sea, its mines killing two civilians; and the first bombs on England for 22 years fell near Canterbury on May 9th, 1940. In June, 100 civilians were killed, in July 300, in August 1,150, and in September, mainly during night raids, the total for the month reached 6,700.

In the first phase of the attack, London was bombed continuously for 76 nights, with the exception of November 2, 1940. About 27,500 bombs of all kinds were dropped. The attack was made indiscriminately but with stronger emphasis on the East End than the Central and West End areas because (*a*) the East End was a shorter flight for the enemy bombers, and (*b*) it was the deliberate and diabolical plan to bomb the poor of the East End in the hope that they might rise in a form of civil war and take over the West End.

The damage was enormous; and confusion looked as though it would turn to chaos until the ordinary people of London ignored the Government and took matters into their own hands—by forcing the Tube stations to remain open as shelters at night. No fewer than 53,000,000 attendances in these stations were logged. In October 1940 there were 120,000 people sleeping in Tube stations and 220,000 in public shelters of various types.

Housing damage reached colossal proportions. In two nights in April 1941 some 148,000 houses were damaged or destroyed in London. In general terms, during the opening raids one ton of bombs on a built-up area destroyed or seriously damaged 115 houses, made 80 people temporarily homeless and left 35 without homes at all. For every civilian killed, 35 were bombed out. By the end of May 1944, and before the V.1 and V.2 attacks began, 3,034,000 houses had been damaged in the United Kingdom, but were not rendered permanently uninhabitable; 175,000 houses had been destroyed; 201,000 were seriously damaged.

Flying bombs and the rockets produced far more devastating damage. One V.1, on average, affected 1,000 houses in densely built-up areas. The first of 1,054 rockets fell on England on September 8, 1944—on London, which in all received 518 rockets. The last landed in Kent on March 27, 1945, and the last attack of any kind was by a V.1 which fell on Datchworth, Herts, on March 29th.

These closing stage attacks damaged or destroyed 1,510,000 houses; and the grand total of damaged houses reached 4,698,000, though as some houses were hit more than once, a harder figure is given as 3,745,000 *different* houses. In effect, two houses out of every seven in the land were affected in some way by enemy action.

The Capital's Share

London received the brunt of the attack. One sixth of Britain's total stock of houses, the 2,150,000 in the London area, took more than half the total damage. Only one house in ten escaped damage of some kind in the Metropolis.

London was in the front line for five years; between the first bomb on Britain and the last, 2,019 days elapsed. The air raid warning siren was sounded in London 1,224 times—and that means that for over five years each citizen of this, the world's largest city, was, on the average, threatened with death and disaster once every 36 hours. To make matters worse, 326 hospitals were damaged on 687 occasions.

Whilst the material damage was vast and widespread, the extraordinary fact emerges that not until three years had passed was it possible to say that the enemy had killed more soldiers than women and children! In all, 62,464 civilians were killed, a further 86,000 seriously injured, and about 150,000 slightly injured: and of these totals approximately half were borne by London.

An astonishing piece of forecasting is revealed concerning the bombing of Coventry. It appears that this town was arbitrarily selected before the war by Professor Bernal and Dr. Garwood in an Appreciation of what might be expected in the way of death and damage from a 500-bomber raid. The results they predicted were almost exactly right. However, the enemy used only 330 bombers, not 500, and the number of bombs dropped was only half the number postulated by the experts—who, in common with almost every other authority, overlooked or at least did not mention the gigantic problem of homeless people.

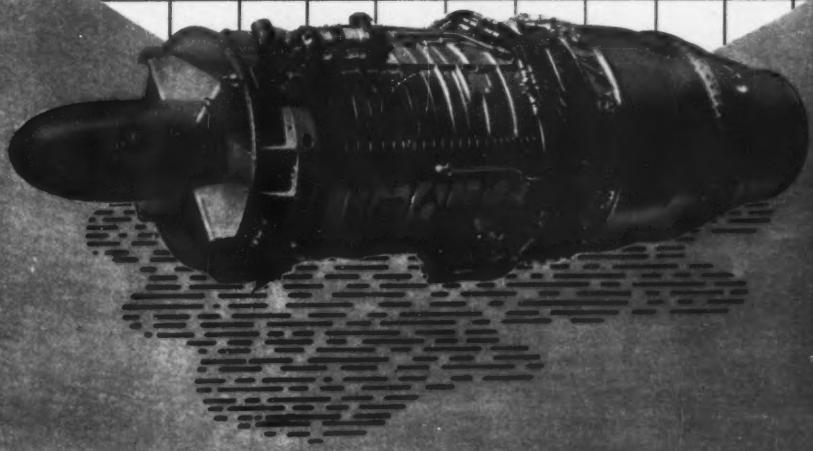
Mr. Richard Titmuss has produced a thought-provoking book, and the figures he has marshalled give a new aspect to war. They also indicate that if England is to be atom-bombed, the housing problem, already acute, will be the major problem; and the paradoxical situation will exist of the necessity to concentrate for maximum production and a need to disperse to avoid maximum destruction.

**By Richard Titmuss. Published by H.M. Stationery Office and Longmans, Green and Co.; 538 pages. Price 25s.*

ARMSTRONG SIDDELEY GAS TURBINE DEVELOPMENT

low fuel consumption

specific consumption of 0.915 lb/hr/lb at max thrust



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POWER / PERFORMANCE

ALREADY 7,200 lb THRUST

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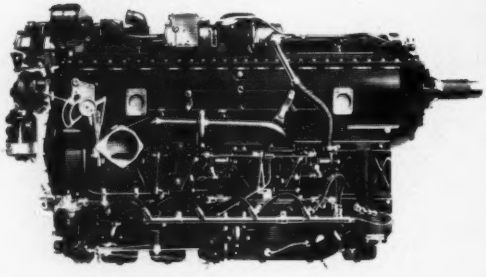
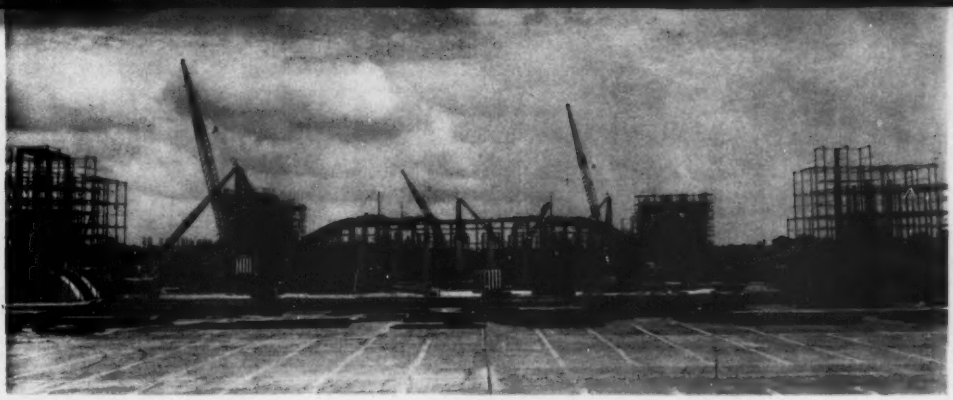


Over a decade ago the Gipsy Six was earning world fame in every rôle open to a light aero engine—in training, in transport, in record flights across the world. The Gipsy Queen 30, of 250 b.h.p., is today the direct successor to the Gipsy Six. It is unsupercharged, ungeared. It has been submitted to the severe test of service in hundreds of post-war trainers; it is the ideal simple power unit for the light transport aeroplane

DE HAVILLAND

DE HAVILLAND ENGINE COMPANY LIMITED
EDGWARE, MIDDLESEX, ENGLAND



An impressive vista of the permanent four-bay hangar now under construction at Heathrow to accommodate aircraft of B.O.A.C.

"WORK IN PROGRESS"

Buildings and Traffic-ways take Shape for the "New Era" London Airport

TO say that the pattern of the United Kingdom's major international air terminal at London Airport is now "taking shape" is, perhaps, an understatement. Any major constructional achievement of this kind can only, by its very nature, be regarded as "progressive"; and it therefore tends to miss publicity of the sort which such a gigantic engineering enterprise merits. During a recent visit to London Airport's "work in progress" area, however, we were positively startled to see the advanced stage which has now been reached.

The building of the main access-tunnel, which is to connect the Bath Road with the central terminal area, has been under way for some time and two of the subsidiary vehicular tunnels have already been completed. In the floor of the enormous pit which is being bulldozed out of the earth between the central "diamond" and the Bath Road (crossing No. 1 runway), a considerable length of the two 20-ft wide carriageways and the two cycle and pedestrian paths is already concrete-surfaced.

A roundabout at the northern end of the tunnel will eventually connect with two approach ramps from the east and west. The western ramp will be constructed first, while the other is to be added at a later date when the central area is in use and certain buildings in the temporary existing terminal area can be demolished. The tunnel system is designed to carry a peak flow of 2,000 vehicles per hour, excluding cycle traffic.

In No. 1 Maintenance area, B.O.A.C.'s vast four-bay hangar, of cantilever steel construction, is well under way, the first of the main steel supporting arches being already in position. Each of the four bays will be 300 ft wide, 140 ft deep and 45 ft high, and will be capable of housing two aircraft of Stratocruiser proportions. Between the bays, multi-storey workshop, office and stores accommodation is incorporated in the overall design. The main units of B.E.A.'s new £2,000,000 maintenance base are also making good progress. The B.E.A. hangar block consists of two rows, each of five bays, separated by a central road. Workshops and offices are provided at the rear of each row and the main stores building is located at one end. The first three bays are expected to be ready by September. In the interim period while the first bays are being built, B.E.A. will probably move into part of the big aluminium-alloy hangar which was recently completed in the No. 2 maintenance area where, incidentally, a permanent single-bay steel hangar has been erected for P.A.W.A.

The building contract for B.E.A.'s new maintenance hangar—seen in this recent photograph to have reached an advanced stage—was awarded to the winner of a competition among 20 contractors specializing in structural steel or reinforced concrete work.

Two of these subsidiary vehicular subways have already been finished.

(Above) A considerable length of the floor for the main access tunnel is now virtually complete. The main portion of the tunnel, which will connect the Bath Road with the central terminal area, is 2,400ft long and 86ft wide. (Below) This three-bay hangar erected for B.O.A.C. is the largest of its type ever built in aluminium alloy.

Our photographer, who secured all these pictures, remarked with good reason that the S.7 is as pretty an aircraft as one could see in the sky. A bubble enclosure and retractable tailwheel could make it almost perfect.

AMBROSINI S.7 in the Air

Flying an Italian Operational Trainer: Low Power but High Performance

No. 44 OF THIS SERIES By THE EDITOR

WHAT better way could there be of starting a week than to drive to Redhill bright and early on a Monday morning, and from there to climb South-coastwards in a lively and responsive single-seater? To a sports-car enthusiast, even the knowledge that the Ambrosini S.7 has an Alfa-Romeo engine under its tight cowlings added zest to the occasion.

It will be remembered that two of these Italian Alfa-powered trainers were entered for the *Daily Express* Race, and it was No. 92, to be flown by Dott. Ing. G. A. Ferrari, which I piloted just before it returned to Italy. The accompanying photographs were taken, incidentally, from the Miles Aries, which, at over 1,500 ft/min, outclimbed the Ambrosini, though it could not match its top speed on the level.

In a class of its own, the S.7 is described by the makers as an aerobatic and military trainer. It was designed in wood for ease of construction by the parent company, or by other concerns under licence, and both single and tandem two-seat versions are being produced. Some forty have been completed for the Italian Air Force and as many more are on order. The majority are *monoposto* and are used by experienced pilots, at present on staff appointments, to practice on and keep their hand in.

In conception the S.7 is not new, and, in fact, it is regarded by most people over here as belonging to a past generation of trainers—if it is a trainer at all in the accepted sense. Nevertheless, it is attractive, and for its power has an interesting performance. We have no counterpart here and would now probably classify it as a private-owner type for competition work or touring, with one or two seats to choice. Of the few British pilots who have been lucky enough to fly the S.7, one at least has aptly described it as a baby Mustang.

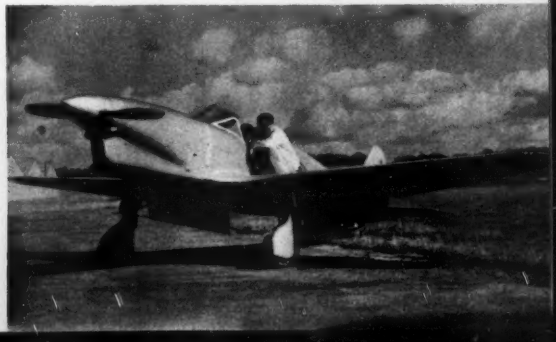
In view of the recent debate in Parliament, during which the lamentable aircraft position—Tigers back—in the R.A.F.V.R. schools was mentioned, one cannot help reflecting that the S.7, or a type like it, is exactly what such units would like to have for ex-Service pilots to practice in. It carries all the necessary equipment and has a representative and worth-while performance on the power of a Gipsy Queen 30.

In the R.A.F.; pilots are instructed to carry out an external check of their aircraft before getting in for a flight. In the more rugged atmosphere of private flying, some light aircraft are lucky if they get any check at all between annual C.s of A. However, old habits die hard, and I gave the Ambrosini a careful once-over before climbing in. What I saw was very pleasing, beginning with a tight-cowled shapely nose, the lower panels of which hinge-up to give unimpeded access to the six-in-line engine. One reason for the machine's complete freedom from dirt and oil is the provision of a tiny tank, bulkhead-mounted, at the delivery end of the breather pipe. Oil can thus be drained away on the ground instead of blowing back over the underside of the fuselage, there to collect flies and dirt. This was one of many unusual gadgets and fitments on the S.7.

The landing gear can be deservedly described as fine, wide and handsome, and the machine sits well on the ground.

Just the sort of morning to be pushing an aircraft out of the hangar: The Ambrosini at Redhill airfield.

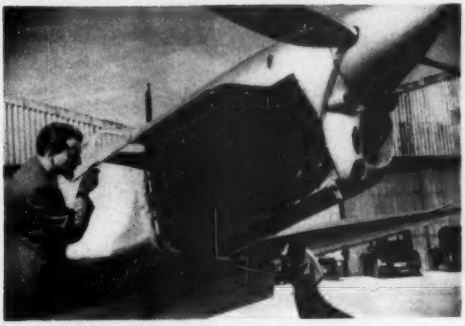
Explanation of the controls and instruments before starting-up. Note the angle and size of the flaps.



(Right) Control and manœuvrability are of a very high order on the S.7, so for this shot it could be tucked with confidence close "inside" the photographic Aries.

"FLIGHT" PHOTOGRAPHS

(Below) The swing-over enclosures for the cockpit and rear compartment on the single-seat version of the S.7. An R.A.F. type F.24 camera can be mounted on the rear cockpit floor.



Signor Guido Ferrari reveals the unusually accessible Alfa 115 engine in his aircraft. Cooling airflow is controlled by gills.

The landing light is linked with the port leg, and folds with it. On this particular machine the wings are beautifully finished and the gun and camera gun ports carefully faired over. The gun, incidentally, would be a 7.7 mm S.A.F.A.T. type with 200 belt-fed rounds.

No trimming tabs of any sort mar the symmetry of the control surfaces, and so close-fitting are the root fillets mounted on the tailplane that no one would detect their freedom to move with it for alteration of incidence—the method employed for fore-and-aft trimming. The tailwheel is neatly spatted and has a castoring lock interconnected with the stick, of which arrangement more will be said later. The flaps are large and have a big angular movement—marked in degrees on the flap nose, as illustrated overleaf.

A swing-over front cockpit enclosure is fitted, which will open on either side, using the bolts on the fixed side as hinges. Both bolts may be released at once for jettisoning in the air or removal on the ground. On this single-seat version the rear cockpit position is occupied by radio and a luggage locker, with batteries behind again. A non-transparent swing-over enclosure, similar to that in front, is fitted over the locker.

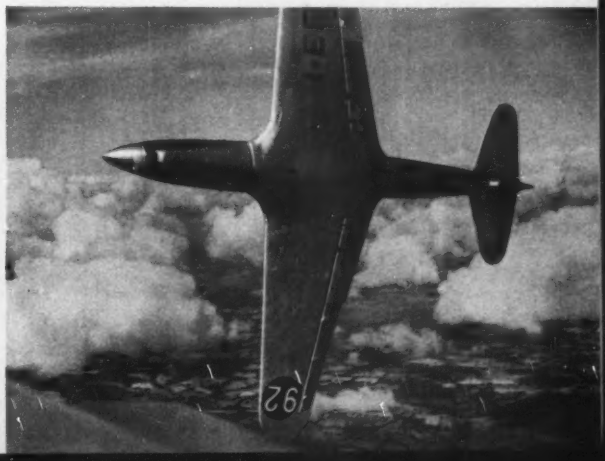
To the pilot learning the cockpit layout of a foreign aircraft everything seems elaborate and confusing. This is mainly because not even the dials of the flying instruments are familiar. In addition, the labels and instructions are sometimes difficult to understand, and may even be misleading to those who do not speak the lingo—for example, *caldo* for the cooling shutters on the Ambrosini means hot. My mind is quite unable to visualize climb in metres per second or convert them into more familiar units. There is something of a colour code apparent in the control system, but it is not fully carried out. Moreover, there seems to be a certain amount of complication of controls and dials which should be avoided in a machine of the type.

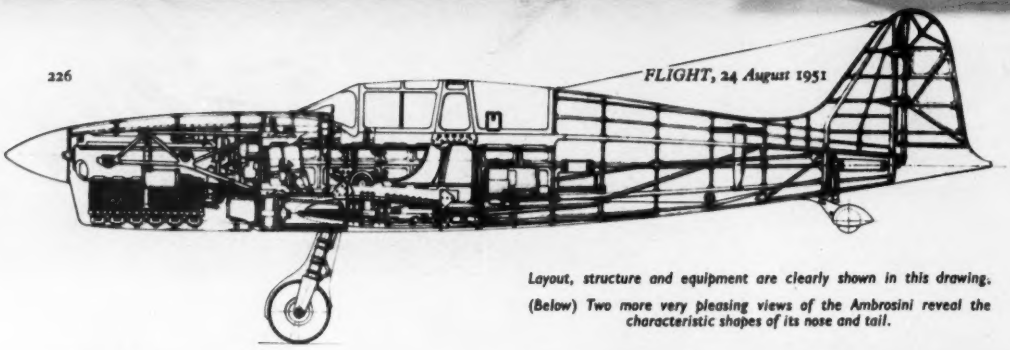
Concerning the central blind panel, the directional gyro also carries a bubble; the horizon bar is adjustable and can be caged; and the turn needle has a sensitivity control which permits Rate 1, 2 or 4 to be selected for a displacement of the square-ended needle by one width. Another device making for ease of blind flying is the provision of a datum mark at the edge of the A.S.I. dial. This is fixed, and the whole dial can be rotated to bring any desired speed against the marker. Should a prolonged approach be required at a 180 km/hr, for example, this speed is set against the marker and from then on the pilot need not read the figure but keeps the A.S.I. needle on the mark—horizontal at 3 o'clock.

Below the blind panel are the r.p.m. and boost indicators, and, below again, engine air temperature (in and out) and oil, fuel, suction and hydraulic pressures.

The surrounding controls are: left floor, wobble pump and

(Below) A peel-off reveals as neat a pair of wheel doors as could be found anywhere. Breather-oil is trapped; hence the spotless tummy.





Layout, structure and equipment are clearly shown in this drawing.

(Below) Two more very pleasing views of the Ambrosini reveal the characteristic shapes of its nose and tail.

AMBROSINI S.7 in the air . . .

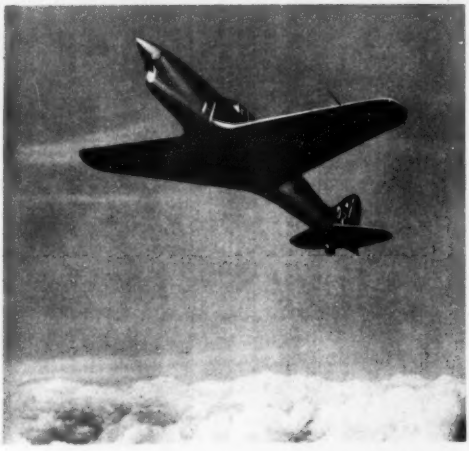
harness release; above it, fore-and-aft trim wheel and indicator, and throttle and pitch levers; left panel, undercart and flap levers, with lights and indicator respectively, and ignition switch; central, engine air gills and carburettor air; also fuselage fuel tank cock and engine cut-out toggle. On the right are the main wing-tanks fuel cock (and fuel gauge), primer and fire extinguisher, starter button and clock; starboard side, electrics; and, on the floor, parking-brake selector, gun and camera controls, main electrical services switches, hydraulic hand-pump, emergency selector and pressure release. The press-to-transmit button is on the throttle, and the stick carries an ingenious twist-for-safe firing trigger. The machine I flew carried four-channel V.H.F. with selector box on the port side; a range receiver, also to port; and over one's shoulder on the same side could be seen the 17-gallon fuselage-fuel-tank contents gauge.

Regarding this fairly formidable selection in the cockpit, one may add that the tailplane incidence is variable for trim, and that this is achieved with the aid of a shaft extending rearwards and apparently worm-operated from the trimmer wheel.

A two-position selector controls the brakes for parking. When "park" is selected, the brakes stay on when applied with the toe pedals on the rudder bar. The castoring tail-wheel is interconnected with the fore-and-aft movement of the stick, and is locked in all positions except stick hard forward.

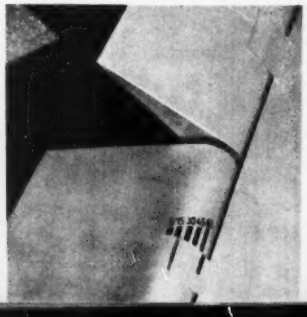
No adjustment is provided for the pilot's seat, but it is possible to adjust the reach of the rudder pedals. The sitting position would not be very comfortable on a long flight, for not only must the legs be straight out in front, but the whole cockpit is very small. It is certain that, for reasons of size alone, the cockpit would be unacceptable in a trainer in this country. However, performance (and appearance) would obviously suffer if it were made larger.

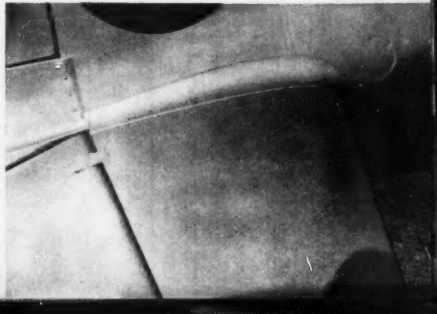
There is nothing about the starting-up procedure which calls for comment. With the requisite taps and switches on, it is a case of prime, switch-on and press. The Alfa idles smoothly,



Length .... 26·8ft. Span .... 28·8ft. Height .... 9·2ft.

(Left) Features of the compact cockpit are described in the text. No. 92 was appointed an "honorary Throttle Bender" while visiting this country for the "Express" Race—hence the insignia. (Below, left) The big flaps have an unusually large angular movement. (Right) The variable-incidence tailplane has neat root fairings.





The "Provost" has successfully completed tropicalisation trials

ALVIS

LEONIDES

ALVIS LIMITED, COVENTRY, ENGLAND

THE PERCIVAL P.56 "PROVOST"

SIDE-BY-SIDE TWO-SEAT BASIC TRAINER

(Leonides Engine)

SELECTED FOR THE ROYAL AIR FORCE

". . . it remains only to be said that the Boscombe Down report on the aircraft was such as to be fairly described as eulogistic, the rate of roll (about 90 deg/sec) and the aileron response, in particular, being extraordinarily good. In the P.56, therefore, it would seem that the Royal Air Force can look forward to having a basic trainer which, for its designed sphere, is without doubt at the moment unrivalled." "*Flight*" *May* 4*th*, 1951.

PERCIVAL AIRCRAFT LTD., LUTON, BEDFORDSHIRE, ENGLAND and at TORONTO, CANADA.

A Hunting Group Company

AMBROSINI S.7 in the air . . .

and should be warmed-up with gills closed at 800 to 1,000 r.p.m. When oil temperature and pressure are correct the mags can be checked at 1,500 r.p.m. Before taxying out, it is also as well to check hydraulic pressure build-up.

With a long nose in front, and a tailwheel undercarriage, visibility ahead is negligible. However, the engine is slender, and a little nose-swinging from side to side enables the pilot to see plenty for safe taxying. It feels most unnatural to stuff the stick forward and open the throttle in order to taxi in such an aircraft, but that is the way it is done on the Ambrosini—another case of the machine which looks nose-heavy on the ground but, in fact, is not.

The brakes on 92 were not particularly good when used differentially *via* the pedals, but they held the aircraft stationary for a full bore run-up when park position was selected. At almost 2,500 r.p.m., the maximum on the ground, the Alfa remained very smooth and noise was by no means excessive.

A standard take-off check sufficed, elevator trim being set just aft of neutral. The trim wheel moves freely when the aircraft is on the ground, but gets steadily heavier as speed increases in the air until it is practically immovable at about 250 m.p.h. (400 km/hr). Flaps are set according to circumstances—I used 15 deg. The response to the flap selector is extremely rapid—too rapid, in fact—and one's hand must do no more than twitch in order to milk-down 10 degrees. The steady position is with lever mid-way; up and down selection is in the appropriate sense.

I took the long run at Redhill into a light wind, keeping the tailwheel locked, with stick in neutral position. I must confess that I was not completely at ease, either with the rudder or with the lack of forward view, although the S.7 kept straight enough. No doubt I was unduly apprehensive, but because of the relatively poor acceleration a long time seemed to elapse before we were established on the climb. Take-off power for the Alfa is 225 b.h.p., and the weight of the aircraft is 3,030 lb. These facts, considered in conjunction with the use of thin, fairly-small-area wings (power loading is 14.1 lb/h.p.) account for the long run. The aircraft unsticks at just over 70 m.p.h., but seems reluctant to climb until speed builds up to around 110 m.p.h.

The wheels come up quickly, and the flaps when raised from take-off position produce no appreciable trim change and very little sink. A good climbing speed is about 120 m.p.h. Until this speed is reached the aircraft gives the impression that it is labouring. According to the makers, it can climb initially with full throttle at 1,100 ft/min. My instrument gave an average reading of just under 4 m/sec for the first 6,000 ft (at 2,450 r.p.m. and 110-120 m.p.h. forward speed). This represents a pleasant. practical sort of climb at 750 ft/min.

Quick-action Undercart

As the wheels and their doors fold up, the sound from the engine changes in the cockpit and, in fact, it would probably be possible to *hear* whether the wheels were properly locked up. I thought that I was even able to hear which wheel went up (or down) first, and the "clunk" of the locks and change of indicator lights confirmed my guess at the timing. The movement of wheels up or down is quicker than the average.

The thing that impressed me at once, when wheels were in and speed had built up, was the aileron response. These controls have the crispness of a fighter rather than the lightness of, say, a Messenger or Chipmunk, and the rate of roll produced is high. The elevators are of the same order, but the rudder is somewhat softer, though powerful in its effect.

At a safe height I set about stalling with and without flaps and power. With everything up, the stall came with very little warning at about 70 m.p.h. I.A.S. It was quite straight until slight rudder was applied, and then a wing dropped firmly, though by no means viciously. As it dropped, it could be picked up quite easily with opposite rudder, and one could sit for a minute or so doing what might be called an incipient falling leaf, or alternatively, a sort of rhumba. With half flap the stalling speed went down to about 65 m.p.h. I.A.S., and a little less with full flap. The symptoms were much the same in each case, and recovery was almost instantaneous. I allowed a turn of spin to develop to the left, and found that recovery began with controls no more than centralized. I had intended to do more spinning later, but when the time came I consulted my watch and realized I that I would be delaying Signor Ferrari's E.T.D. for Italy.

Before sliding in beside the photographic Aries, I did some rolls, slow and barrel, at various speeds between 150 and 200 m.p.h., and found the S.7 very sweet and smooth to take round them. I even made a fairly successful stab at a hesitation roll to starboard. Encouraged, one to port was attempted with speed rather too low, but this had to be abandoned half-way round with a coughing Alfa and with the nose pointing to a nearby farmhouse instead of on the horizon. A mental note was made to brush up my aerobatics—one of the results of normally using a wholly likeable but non-aerobatic machine like Gemini G-AFLT.

A loop or two and rolls off the top were pleasantly easy to execute with the S.7. The powerful effect of the rudder enables the pilot to come out of the half roll very precisely, right down to near-stalling speed. I glanced at the A.S.I. going up, and on the top of the loops, and found that there was much less fall-off in the speed than might have been expected. Apparently the speed for the S.7's loop and the size of loop could both be varied within wide limits without spoiling the manœuvre.

On the way back to Redhill from somewhere near Lewes I trimmed carefully in normal cruising conditions at about 300 km/hr (186 m.p.h.) and tried flying hands and feet off. It was necessary almost at once to keep the nose straight, but wings and nose held steadily on the horizon for as long as I liked to leave them. One way to describe the lateral stability would be to say that the ailerons seem to be a shade on the positive side of neutral. The nose was pushed down until speed built up by about 30 km/hr and again the aircraft was left to fly itself. It was pleasant to see the nose very gently come up, until the speed was dropping below the 300 km/hr mark, and as gently settle into the level position again.

As the airfield came into sight I put the nose down at about 4,000ft and dived until the A.S.I. showed 480 km/hr (300 m.p.h.). The S.7 made no fuss, and both the ready acceleration and absence of wind noise spoke of aerodynamic cleanness. The controls remained reasonably light but it was at this point that I discovered that the incidence trimmer wheel was almost "solid."

No particular top speed limit is placed upon flap and wheel lowering so far as I could ascertain—it is just a case of being reasonable. I set about making a normal circuit and fairly wide approach as soon as I had got the speed down after the dive.

Once the wheels were locked down the drag they produced necessitated a considerable increase in power to hold height. I made a long shallow turn onto the final approach and flicked down 15 deg of flap half-way round. This made the approach a little steeper. Finally, I used full flap, which flashed down on selection, greatly increasing drag but making practically no trim change.

Down to Earth

On the first attempt I undershot by quite a lot, and to keep the speed up to 90 m.p.h. and prevent the sink being too rapid full cruising power was needed. The S.7 sits down very firmly and nicely and keeps quite straight after touch-down. The stick is, of course, back, so the tailwheel is locked.

On a second circuit and bump I felt more at home when getting airborne, but again found the run very long, and the first few seconds in the air felt leaden. This time I made a steeper approach, but again nearly undershot when full flap came down. The aircraft descends very quickly, but its attitude on the approach is rather flat. It is as well to get a good clear landing path sorted out, because there is little enough to be seen ahead once one is down.

For an overshoot it is necessary to raise the flap by at least 30 deg from the full-down position. I was told that the S.7 won't go round again with flaps and wheels down. This fact, the stick-forward taxying, the lack of forward view on the ground, the stall with practically no warning, and the feel of the initial climb after take-off are all characteristics which, while they might be acceptable to a reasonably experienced pilot, and might be met individually in an operational aircraft, are still not good in a trainer. However, they do not prevent one being left with very pleasant impressions of handling a thoroughbred.

In conclusion, I may add that if the cockpit harness is as efficient as it is simple—and I was given no cause to believe otherwise—it is worth further examination in this country. Normal shoulder-straps meet at a quick-release attachment which is in turn clipped dog-lead-fashion to a nicely plated chain anchored centrally at the front edge of the pilot's seat. Adjustment of length is effected by clipping on to the appropriate link.

Main dimensions are given with the g.a. drawing on page 226; other data are as follows :—

DATA FOR THE AMBROSINI S.7

225 h.p. Alfa-Romeo 115ter Six-in-line Engine

Maximum s.l. speed	223 m.p.h.
Stalling speed	71.5 m.p.h.
Initial rate of climb	1,100 ft/min
Service ceiling	17,200ft
Take-off distance	273 yd
Take-off time	15 seconds
Range at 3,000ft and 165 m.p.h.	515 miles
Fuel capacity:	
Wing tanks, total	25 gallons
Fuselage tank, single-seater	17 gallons
Wing area	137.8 sq ft
Wing loading	22 lb/sq ft
Power loading (max. continuous)	14.1 lb/b.h.p.
Weight empty	2,365 lb
Useful load	666 lb
All-up weight	3,031 lb
Structure load-factor	not less than 12
Max. dive speed (compliance with I.C.A.O.)	370 m.p.h.
Wing thickness (max. at root)	12 per cent

COULD THE AIRSHIP PAY?

An Examination of its Commercial Possibilities

By

Capt. L. ARTHUR, D.F.C., F.R.Met.S., F.R.Ae.S.

AT the risk of offending those who maintain faith in the possibilities of the airship as a commercial vehicle we may describe this article as being mainly of academic interest. Deliberately envisaging some era, in the comparatively near future, when the dirigible might return (perhaps with atomic power, though conventional fuel figures in the calculations), the author makes what he terms "a serious attempt to show what to expect when associating the airship with practical airline operation and commercial profits." Capt. Arthur is an airline pilot of considerable experience and was a Bomber Command pilot during the war. His opinions are entirely his own.

THIS article pre-supposes that a designed dirigible has been contemplated and that preliminary performance data are required to assess the commercial potentialities of the ship.

Types of power plant vary considerably, but the brake horse-power required is found, and the most convenient subdivision of power is assumed to be a matter for the designer. Figures for sea level are also calculated, as extensive oceanic crossings may be planned, envisaging the use of steam propulsion in conjunction with atomic-element boilers.

Much of the information on airships must be garnered from German, American and British sources, coupled with standard formulae common to the laws of physics. This simplification does not diminish the importance of the figures obtained, as the co-efficients are calculated from performance data on previous large airships.

The specification of a dirigible, based on commercial requirements, could be expected to take the following form:—

(1) It must be capable of flying the route London-Perth, Australia, direct—8,700 nautical miles with a payload of not less than 50 tons or 112,000 lb.
(2) Whilst fulfilling (1) it must also carry a paying load as above with enough fuel retained, extra to cruising requirements, for the purpose of manœuvring and circumnavigating inclement tropical weather and cyclonic disturbances.
(3) The ship must maintain an altitude of at least 5,000ft on a barometric sub-scale setting of 1013.2 millibars on the I.C.A.N. altimeter.
(4) The ship must be able to reverse.
(5) Helium must be used.
(6) For haulage of freight over a stage-length of 800 nautical miles and less, payload must not less be than 70 tons at 5,000ft at 80 kt.
(7) The ship must have enough engine power to maintain a minimum ground speed of nil in winds of 100 kt.
(8) The safety factor is to be 3 : 1.
(9) Operating cost to be 1d/ton-mile.

Stage 1 (Primary).—From previous airship designs* (in an era when metallurgical research and design had not reached today's efficiency) it is possible to obtain a simple ratio of dead weight to maximum lift. This ratio can be taken as 55 per cent, so that 45 per cent of maximum lift must be divided between payload and fuel. Item 9 calls for an operating cost of 1d/ton-mile. Item 1 demands 50 tons of payload. Route-distance is 8,700 nautical miles. Fuel is reckoned at 1s 8d per Imperial gallon, s.g.7.2.

* *Akron, Graf Zeppelin, Hindenburg and R.*101.

"Flight" photograph

The "Graf Zeppelin" (3,710,000 cu ft, length 772 ft, max. diameter 100ft). In 1929 she made a 21,500-mile world flight in 12½ days air time and, later, many commercial crossings of the South Atlantic.

Commercial Assessment.—To allow for variable bookings, it is best to aim for an operational cost of 0.7d/ton-mile :—

Ton-miles London-Perth = 435,000		
No. of gallons allowed at 0.7d/ton-mile	=	$\frac{435{,}000 \times 0.7}{20}$
	=	15,225 gals
Weights (lb) of :—		
Fuel	=	109,619
25 per cent reserve fuel	=	27,404
Payload	=	112,000
10 per cent reserve payload	=	11,200
Disposable load	=	260,223 lb

Now this figure is approximately 45 per cent of the maximum lift. Therefore, the total lift at the selected altitude must be approximately 578,000 lb.

The dirigible must reach its pressure altitude at not less than 5,000ft with a load of at least 578,000 lb. In order to give more latitude in payload-altitude calculations and to allow an added safety-factor in humid and high-temperature conditions it would be better to design for an altitude of 7,500ft. The percentage-filling of bags is governed by the altitude planned and the inverse ratio P/P_0.

In the I.C.A.N. atmosphere P/P_0 for 7,500ft is almost 0.8 or 80 per cent. To lift 578,000 lb at P/P_0 altitude of 80 per cent the bags must be capable of lifting 722,500 lb at sea level in the I.C.A.N. atmosphere.

Capacity of Bags.—The formula for obtaining capacity at standard temperature is :—

$$V = \frac{L}{Da - Dg}$$

where L = Lift
Da = Wt/cu ft of air
Dg = Wt/cu ft of gas
V = Volume

$$\therefore \text{Volume} = \frac{722{,}500}{0.07651 - 0.01056} \text{ cu ft}$$

$$= 10{,}947{,}000 \text{ (say } 11{,}000{,}000) \text{ cu ft}$$

Summary.—Briefly recapitulating, (1) deadweight/lift ratio was 55 per cent; (2) from 0.7d/ton-mile operating costs, and fuel price and the capacity ton-miles the fuel weight was calculated; (3) payload was known; (4) items 2 and 3 being known and equal to 45 per cent of lift, the gross weight at cruising altitude was ascertained; (5) by conversion to sea

level through the inverse ratio P/P_0 for 100 per cent bags it was possible to assess the lift at sea level; and (6) by conversion of lift to helium-capacity volume was obtained.

Stage 2 (Secondary).—In assessing the performance of this airship, the Stage 1 breakdown is again checked against the initial commercial specification.

The calculated volume was 11,000,000 cu ft. Herr Hans Ebner found by practical experiment that a finess ratio of 5 or 6 to 1 was best for the low speeds attained by dirigibles. In order to enclose 11,000,000 cu ft and maintain a shape fitted to quick production and slimness, this volume can be enclosed within the dimensions 980ft in length and 140ft in diameter. This space allows adequate engine-displacement, and accommodation for passengers, as well as ballast and tankage space. From previous airship figures it can be found that a drag-coefficient of 0.05 will when used in the formula as follows :—

$$\text{Drag} = KAV^3\rho$$

$$\text{gives T.H.P.} = \frac{KAV^3\rho}{550}$$

From this formula a series of anticipated performance figures at various altitudes can be calculated.

Data at Sea Level :—

Total lift	722,500 lb
Dead weight (for 7,500ft pressure altitude)	317,777 lb
Fuel and payload	404,723 lb
Maximum diameter	140 ft
Length	980 ft

ALTITUDE v LIFT

Altitude (ft)	% Bags	Max. lift (lb)	Fuel (lb)	Payload (lb)	Payload (tons)
Sea Level	100—	722,500	100,000	304,723	136
3,000 ...	90	650,000	100,000	222,223	99
5,000 ...	85	615,000	100,000	187,223	83½
7,500 ...	80	578,000	100,000	160,223	72
10,000 ...	74	535,000	100,000	117,223	52½
15,000 ...	63	455,000	100,000	37,223	16½

ALTITUDE/PAYLOAD/RANGE CURVES

(Consumption = 0·5 lb/b.h.p./hr. η = 85 per cent)

Speed (kt)	b.h.p. rqd.	Cons. per hr (lb)	With 50,000 lb fuel load: range (n.m.)	payload (tons)	With 100,000 lb fuel load: range (n.m.)	payload (tons)	With 150,000 lb fuel load: range (n.m.)	payload (tons)
At Sea Level:								
100	19,300	9,650	520	158	1,040	136	1,560	113
90	14,700	7,350	612	158	1,224	136	1,836	113
80	9,900	4,950	810	158	1,620	136	2,430	113
70	6,600	3,300	1,060	158	2,120	136	3,180	113
60	4,100	2,050	1,490	158	2,980	136	4,470	113
50	2,340	1,170	2,140	158	4,280	136	6,420	113
40	1,240	620	3,225	158	6,450	136	9,675	113
At 5,000ft:								
100	17,400	8,700	575	106	1,150	83	1,725	61
90	12,700	6,350	710	106	1,420	83	2,130	61
80	8,850	4,425	910	106	1,820	83	2,730	61
70	5,850	2,925	1,200	106	2,400	83	3,600	61
60	3,650	1,825	1,640	106	3,280	83	4,920	61
50	2,100	1,050	2,380	106	4,760	83	7,140	61
40	1,110	505	3,950	106	7,900	83	11,850	61
At 10,000ft:								
100	14,500	7,250	690	75	1,380	52½	2,070	30
90	10,600	5,300	850	75	1,700	52½	2,550	30
80	7,400	3,700	1,080	75	2,160	52½	3,240	30
70	4,800	2,400	1,460	75	2,920	52½	4,380	30
60	3,025	1,513	1,980	75	3,960	52½	5,940	30
50	1,740	870	2,870	75	5,740	52½	8,610	30
40	920	460	4,350	75	8,700	52½	13,050	30

Item 1 of the specification calls for a payload of 50 tons minimum over a stage-length of 8,700 miles at 5,000ft pressure-altitude. By reference to the tables on performance it can be seen that the airship will fulfil these demands of non-stop flight :—

Stage 3 (Schedules):—

Case A. Eastbound. London-Perth at 10,000ft. Wind component + 15 kt at altitude. Distance, 8,700 n.m.; air-speed, 40 kt long-range cruise; ground-speed av. 55 kt; flight time, 158 hr; Payload, 52½ tons; endurance at 40 kt, 217 hr. Elapsed time, 158 hr.

Case B. Westbound. Perth-London at 5,000ft. Calling at Colombo and Cairo, due to headwinds of 20 kt all along route.

Perth-Colombo : Distance, 3,420 n.m.; air-speed, 60 kt; ground-speed, 40 kt; flight time, 85 hr; endurance, 96 hr (at 60 kt); payload, 50 tons.

Colombo-Cairo : Distance, 3,100 n.m.; air-speed, 60 kt; ground-speed, 40 kt; flight time, 77½ hr; endurance, 96 hr (at 60 kt); payload 50 tons.

Cairo-London (via Malta, Elmas, Toulouse, Bordeaux, Rennes, Havre, Dover) : Distance, Cairo-London, 2,200 n.m.; air-speed 80 kt; ground speed, 60 kt; flight time, 36½ hr; endurance, 39½ hr (at 80 kt); payload, 50 tons.

Elapsed time (with 6 hr for inter-moorings), 205 hr.

Case C. Eastbound, stopping at Cairo and Colombo. Height 5,000ft. Wind component + 20 kt.

London-Cairo (2,200 n.m.); air-speed, 100 kt; ground-speed, 120 kt; flight time, 18 hr, 18 min; endurance, 20 hr; payload 50 tons.

Cairo-Colombo (3,100 n.m.); air-speed, 80 kt; ground-speed, 100 kt; flight time, 31 hr; endurance, 39½ hr; payload, 50 tons.

Colombo-Perth (this stage-length to be flown at 1,000ft, due to extra payload at Colombo) : Distance, 3,420 n.m.; air-speed, 70 kt; ground-speed, 80 kt; flight time, 42½ hr; endurance, 46 hr; payload 110 tons. Total elapsed time (with 6 hr for inter-moorings), 98hr.

Stage 4 (Public Transport Schedules):—An example of the flexibility of the dirigible over trans-oceanic stages can be seen when payload is doubled on the Colombo-Perth sector, where no topographical hazards are present. The resulting public-transport schedules represent those expected of a modern dirigible and in no way are they optimistic. The payload is always 50 tons except where stated otherwise.

		G.M.T.	Local time	Local date		
London	(dep.)	0400	0600	Mon.	Wed.	Fri.
Cairo	(arr.)	0200	0400	Tues.	Thur.	Sat.
Cairo	(dep.)	0500	0700	Tues.	Thur.	Sat.
Colombo	(arr.)	1200	1730	Wed.	Fri.	Sun.
Colombo	(dep.)	0300	0830	Thur.	110 tons payload on this	
Perth	(arr.)	2200	0600	Sat.	Sector (Mon., Wed.)	
Perth	(dep.)	0700	1500	Sun.	Tues.	Thur.
Colombo	(arr.)	0400	0930	Tues.	Thur.	Sat.
Colombo	(dep.)	0700	1230	Tues.	Thur.	Sat.
Cairo	(arr.)	1300	1500	Fri.	Sun.	Tues.
Cairo	(dep.)	1600	1800	Fri.	Sun.	Tues.
London	(arr.)	0500	0500	Sun.	Tues.	Thur.
Perth	(dep.)	0100	0900	Mon.	Wed.	
Aden	(arr.)	0900	1200	Thur.	Sat.	
Aden	(dep.)	1200	1500	Thur.	Sat.	
London	(arr.)	1600	1600	Sun.	Tues.	
London	(dep.)	0600	0600	Sun.	Tues.	
Aden	(arr.)	1800	2100	Wed.	Fri.	
Aden	(dep.)	2100	2400	Wed.	Fri.	
Perth	(arr.)	0300	1100	Sat.	Mon	

Stage 5 (Statistical Summary):—

Assuming 100 passengers per ship; frequency of three ships each way per week; fleet miles travelled per week, 52,200; fleet miles travelled per annum, 2,714,400; payload, 50 tons (available) :—

Capacity ton-mile per annum	135,720,000
Available seat-miles per annum	271,440,000
Revenue ton-miles per annum (60 per cent bookings)	81,432,000
Revenue seat-miles per annum (60 per cent bookings)	162,864,000
Revenue at 1d/passenger-mile/annum (60 per cent bookings)	£ 678,600
Revenue at 1s 4d/ton-mile/annum (60 per cent bookings)	£ 5,428,800
Total Revenue	£ 6,107,400

Fares	£ s
Return fare (based on above costing)	72 10
Single fare	36 5

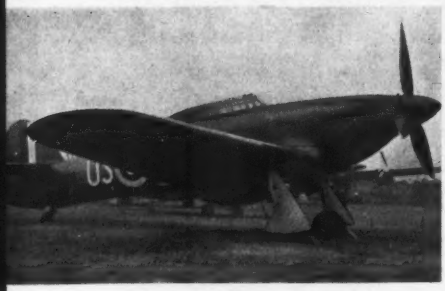
These fares would be affected by catering charges and other expenses not allowed for in purely operational calculations; however, the prices compare well with all other forms of transport to Australia. The schedule is generally "slow" to allow for the possibility of headwinds persisting over the 8,700 miles of route all the year round. Such conditions are unlikely, and some fast easterly trips should be possible. As a final example, on a flight at 10,000ft with a wind component of + 25 kt, the trip to Perth would be as follows : Payload, 50 tons; air-speed, 40 kt; ground-speed, 65 kt; flight time, 134 hr.

Schedule at 40 kt :—
London depart 0900 G.M.T. Monday
Perth arrive 2300 G.M.T. Saturday (0700 Sunday, local).

Schedule at 50 kt (116 hours) :—
London depart 0900 G.M.T. Monday
Perth arrive 0500 G.M.T. Saturday (1300 Saturday, local).

CORRESPONDENCE

The Editor of "Flight" does not hold himself responsible for the views expressed by correspondents in these columns; the names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.



The Hurricane G-AMAU wearing film "make-up" (see letter, below, from Mr. J. D. R. Rawlings.)

Hurricane Warpaint

IN your issue of August 3rd, 1951, your correspondent Mr. Ian H. Gordon appears to doubt whether the original aircraft flying from Kenley on film work is, in fact, *Last of the Many* (G-AMAU). That this is correct was confirmed at the recent Hendon Display.

On closer inspection, the Hurricane I (P2619) in the static park was found to be G-AMAU itself, although a thorough attempt had been made to disguise its identity. The camouflage details were correct for the Battle of Britain period and the leading edge carried the eight gun covers which were such a familiar sight in those days. P2619 was a Mk I serial and the code letters were those carried by 56 Squadron, not 600 as stated by your correspondent. This latter squadron carried "BQ" and anyway, flew the Blenheim IF and Beaufighter.

Externally, only two features came to my notice which showed that it was not a Hurricane I used by 56 Squadron in 1940. Firstly, the arrangement of the exhausts for the Merlin bore no resemblance to the ejector exhausts carried by both Mk I and Mk 2 Hurricanes in the war years. Secondly, the style in which the code letters were painted was very different from the square, large light-blue letters of 1940. In those days the letters were as large as the fuselage side could carry, whereas those on "P2619" at Hendon were small, white and rounded. This latter, however, is a small point about which only the most pedantic would quibble.

Altogether, then, whoever is responsible for disguising G-AMAU has made a very creditable effort of it, so different from most attempts to restore historical aircraft for the films; and it is to be hoped that this example will inspire other film companies to make those little extra efforts which make so much difference to the finished article.

East Horsley, Surrey. JOHN D. R. RAWLINGS.

Early Origin of the Delta Wings

IN his article, "Aerodynamics of the Delta" (*Flight*, August 10th), Mr. J. R. Ewans states that the first idea of using triangular plan form for aircraft wings, now known as delta, was in 1943, when Professor Alexander Lippisch conceived his LP-13a project, followed by the glider version known as the DM-1 (the latter being equipped, I believe, with a powder rocket for the purpose of high-velocity dives).

I have no desire to dispute the claim of Prof. Lippisch in his revolutionary work on delta wings, but would like to suggest the *original basic idea* of delta wings goes back as far as the year 1867, when two Englishmen, named Butler and Edwards, actually drew up the design of a rocket powered machine with delta-shaped wings! For obvious reasons, this then utterly fantastic design in those very early days remained nothing more than a "dream project," as did many other designs for "flying machines."

For this information regarding Butler and Edwards, I am indebted to my American friend, Mr. Douglas Rolfe (who happens to be one of the best known aviation artists in the United States). I enclose herewith a cutting taken from the June 1950 issue of *Air Trials*, showing Mr. Rolfe's drawing of this "project".

To me it seems strange that no reference whatsoever to this very early project is to be found in the National Aeronautical Collection at South Kensington. Unfortunately, I cannot name the actual source of Mr. Rolfe's research in this case, but judging from his many years of studies in the field of very early examples of aeronautics, I should say that would be completely reliable.

Prestwick, Ayrshire. DENNIS M. POWELL.

[The drawing referred to by Mr. Powell shows an aircraft exactly similar in form to a schoolboy's paper dart. A rectangular area cut out of the keel accommodates a pilot's nacelle which can be slid backwards or forwards to change the c.g. Propulsion is by a gunpowder rocket mounted aft.—ED.]

Helicopter Layouts

PAST issues of *Flight* have referred to the values of various helicopter power systems. The conventional engine with mechanical drive gives the lowest fuel consumption, whereas blade-tip reaction drives generally give high ratios of disposable load to empty weight. Taken alone, such figures can be very misleading. The only true measure of the value of a transport aircraft is the operating cost per ton of payload per mile, for a given speed and distance.

The intitial cost of the aircraft is defrayed over several thousand flying hours and so is relatively unimportant compared with fuel and maintenance costs. It is possible that the specific fuel consumption of the ramjet system could be reduced below 2.0 lb/h.p./hr and that of the central pressure systems below 1.0 lb/h.p./hr, although present figures are much higher; but, even allowing for differing maintenance costs, the conventional system would give a lower operating cost, using either piston engines or turbines, for all reasonable conditions. Incidentally, one wonders whether an efficient worm drive could be used. Apart from the simplicity, there should be a reduction in noise and vibration.

Tip-mounted turbojets have been suggested and, with fan augmentation, would be very economical, though open to criticism on account of the high centrifugal loads and the possibility of asymmetrical engine failure. Another system, that of the French S.O.1100, uses an engine driving an airscrew for normal flight as an autogyro, and driving a compressor which supplies air to tip jets for take-off and landing. Although some advantages accrue, the weight of airscrew, clutches, compressor and burners is about equal to that of a conventional transmission, and prolonged hovering would be expensive.

Single rotors appear to be rising in favour, but I would suggest that the twin side-by-side intermeshing layout is worthy of more attention, as the transmission is very compact and the power loss and complication of a tail rotor are avoided. Perhaps it is significant that although birds and modern fixed-wing aircraft have single wings, the insects which maintain a horizontal attitude when hovering have double wings with a compact "central drive."

Manchester, 19 G. R. BARRATT.

Rearward-facing Seats

THE letter (August 10th) from Mr. John Howard, and others, leads one to suspect that the many advocates of rearward-facing seats are inclined to quote accidents which support their case and conveniently ignore others which don't.

Though I may myself have been misinformed, I am under the impression that, in a recent take-off crash involving a Valetta at Lyneham, the passengers lost their lives in spite of the fact that they were in rearward-facing seats.

Swindon, Wilts. J. SCOTT.

The Navy and Coastal Command

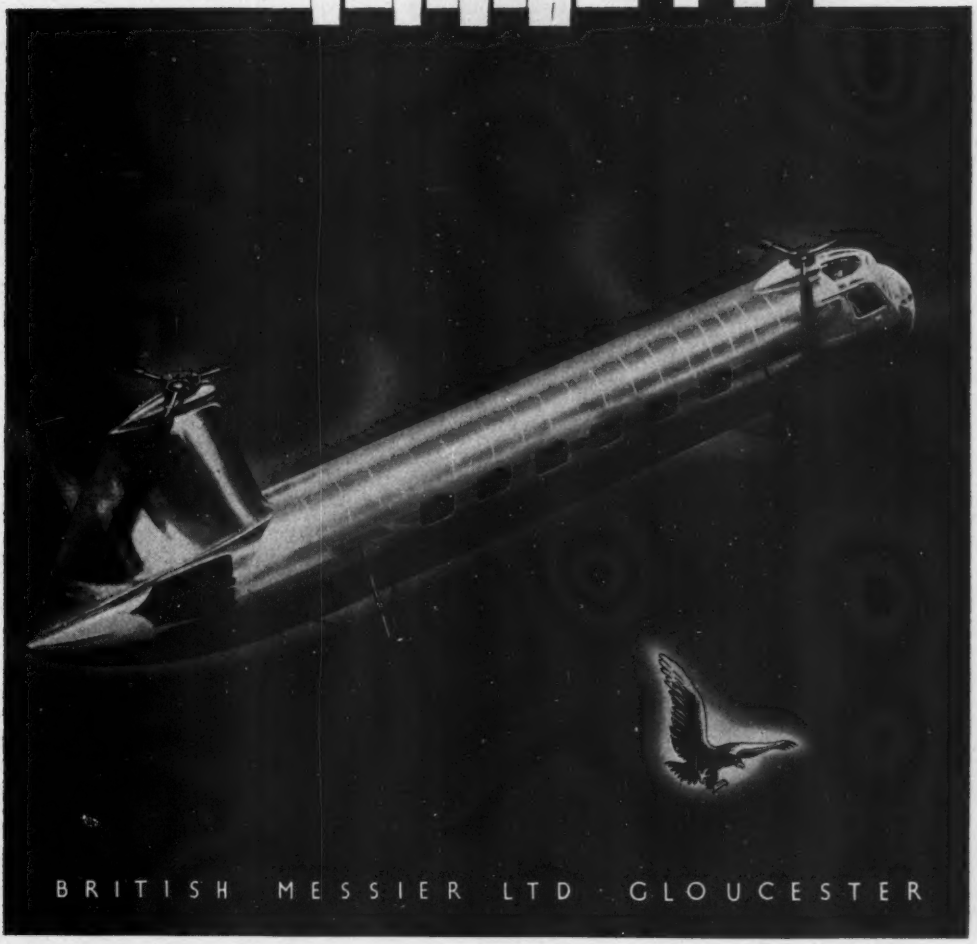
I WOULD like to comment briefly on the article by "Icarus" in your issue of August 3rd. Before doing so, and without carping on matters of detail, I do feel that a passing reference must be made to the very disjointed development of the argument.

Why, for example, should increasing Russian potential in the form of a balanced Air Force—particularly when only glimpsed through chinks in the Iron Curtain—lead to the assumption in the following paragraph that the Royal Air Force is unbalanced? The theory that a half-trained side can act as an efficient team is a new one. Why, having accepted that there is such a thing as air power in the first sentence of the fourth paragraph should the rest of the paragraph be devoted to showing that (1) the aircraft is not a weapon (why less so than a battleship is not made clear) and (2) in any case the aeroplane is ancillary to land and sea warfare?

The fact of the matter is that "Icarus" himself is thirty years out of date and, to mix a metaphor, is batting on a sea wicket. Even granting the still debatable point that the Navy requires its own aircraft in order to protect its ships, what has that to do with the desire of the Admiralty to attack, with shore-based aircraft, an enemy naval objective? Surely this is merely a division of responsibility for strategy, a division which all energies are now devoted to removing. After all, the naval objective may be important to the Navy, but of comparatively little consequence in comparison with other targets. On this argument aircraft carriers in Korean waters, because they attack land targets, should be controlled by the Army.

MESSIER

Landing Gear on the "Bristol" TYPE 173



let Desoutter's Little Horses do the donkey work

ALL OVER THE WORLD men are busily engaged hour after hour twiddling screw-drivers and turning braces. Soon their wrists ache, their arms tire, their backs develop lumbago and their throats cry out for lubrication. By the time they get home they are so exhausted they can't fancy the tasty meals their wives have prepared for them. Quarrels ensue, pieces of fish and potato are flung about, followed by floods of tears, separate bedrooms and even divorce. And all this because they don't or won't learn about Desoutter's Little Horses. Lord what fools these mortals be—as our Managing Director rather wittily remarked.

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CORRESPONDENCE . . .

The prime fallacy in the whole argument is that the air over the sea is different from, and separated from, that over the land; and, therefore, by implication, that Coastal Command exercises sea power and not air power. Nothing could be farther from the fact.

"Icarus" admits that air power played a dominant role in the last war, and, therefore, demolishes his own later doubts as to whether in fact air power exists as a third force. In modern global warfare, sea, land and air forces are all necessary to the successful conclusion of hostilities. Overall strategic direction is, however, a *sine qua non*, and to break up the offensive power of one of the three partners by parcelling out for purely tactical considerations just does not make sense.

Even allowing that at times the strength of Coastal Command has been unsatisfactory, that is due entirely to the political considerations which dictate the funds allocated to Air Ministry. The first duty of the Air Staff is to ensure air superiority. This must rest first on bomber strength and secondly on fighter strength for the defence of the base. If this superiority cannot be achieved, the allocation of Coastal Command forces is sheer waste. The Navy and its carriers themselves cannot operate without air superiority and CANNOT PROVIDE IT.

Coastal Command is by no means regarded as "of secondary concern" by the Air Ministry any more than it is by the Admiralty. In the former case, air superiority must come first. In the latter, it is an adjunct to the operation of ships and as such relies for its strength on an Admiralty allocation of available funds as between ships and air. If the Admiralty operated shore-based aircraft for the attack of purely naval targets, the force so allocated would reduce by that amount the strength available for the overall air strategy.

From the point of view of the Admiralty, however, a more serious defect is that in time of need they would be unable to call upon a supreme effort by, if necessary, the entire resources of the Royal Air Force. A situation is easily conceived in which the whole air strength available may be required to deal with a naval threat. During the last war Bomber Command was called upon more than once to supplement Coastal Command and Naval Air forces.

It is only by the integration and unification of all air forces that maximum air power can be obtained and can be directed according to the needs of the supreme strategy. That is the over-riding consideration and such purely administrative problems as training cannot be permitted to obscure it. But even as a debating point the training aspect offers "Icarus" an unsteady platform, certainly not a weapon. All Naval officers must serve, and rightly, as ship's officers to qualify for promotion. Naval strategy and not air strategy is and must be their background.

Epsom, Surrey. W. N. CUMMING.

GAS TURBINE MATERIALS

A Note on Some Steels Developed for use Under Exacting Conditions

THAT the steel manufacturer "must always be one step ahead" is the burden of these notes on the use of special steels in gas turbine development and production. Prepared by a member of the technical staff of Firth-Vickers Stainless Steels, Ltd., they review the materials used in the early Whittle units, and some observations on steels used in gas turbines today are included.

IN the ten years that have passed since the first flight of the Gloster E.28/39, the revolution that has taken place in methods of aircraft propulsion is truly remarkable, especially when one bears in mind that the aircraft industry itself is little over 40 years old.

It is interesting to reflect, therefore, on the complex problems which have faced the designers, engineers and, in their turn, the steel and alloy makers, in whose hands rests much of the responsibility for the success or failure of so many enterprises. When work started in earnest on the Whittle unit in 1936, the best materials available had reliable physical properties, without excessive creep, only up to about 500 deg C. The steel used for the initial experimental work was Firth-Vickers "Stayblade," and this material itself represented a considerable advance on those previously available; it was a development of "Staybrite" corrosion-resisting steel, and was used for the discs in the W.1 engine which powered the E.28/39 on its first flight. In fact, because of its higher creep strength, "Stayblade" continued in use for discs for practically all the development work until the end of 1943.

From 1937 to 1939 there was a steady improvement in the engine's performance, and the conditions imposed on the turbine blades became increasingly severe, largely owing to the higher operating temperatures employed. With the introduction of "Rex 78" steel by Firth-Vickers research laboratories in 1939, further increases became possible. "Rex 78" was used for the blades in the W.1 and W.1.X engines as it possessed considerably improved properties at elevated temperatures, being capable of working at a temperature 100 deg C higher than other materials under trial at that time. This was a very remarkable achievement, and when the E.28/39 first flew, powered by the W.1.X engine, both the turbine blades and the nozzle blades were made in "Rex 78." It may, incidentally, be placed on record that W/C. Whittle (now A. Cdre. Sir Frank Whittle) wrote to the late Dr. Hatfield on November 10th, 1941, "Indeed, without the special steels which you have developed, it would not have been a practicable proposition. You have therefore provided an essential link."

Another technique which progressed at the same time as the main development of gas turbines was the process of producing stator-rings and similar structural components by the centrifugal casting process. This method, pioneered by the Firth-Vickers foundry and continuously developed by them, has made the production of these components a sound economic proposition. In the early days rings were made by forming Stavbrite F.D.P. and H.R. Crown Max steel bars to ring shape, welding the joint, heat-treating to remove welding and bending stresses, and finally machining the ring to the desired section. This method was used for producing the Staybrite F.D.P. steel rings for the W.1 and proved a lengthy and costly business. Today numerous gas turbine components are made by the centri-spinning process, and, with modified techniques, complicated sections in the improved heat-resisting steels are in regular production.

Many other components for jet units are made from heat-resisting steels in sheet form and operate under conditions of high temperature and stress. Staybrite F.D.P., as used in the original engine, is still employed extensively. Although this steel is a standard corrosion-resisting material stabilized with titanium, it possesses useful strength and resistance to oxidation at temperatures up to 800 deg C.

As the designer's demands have increased, so the materials offered to him have improved; but the steel manufacturer must always be one step ahead. Many different alloys have been devised, with varying success, and amongst these Firth-Vickers have comparatively recently developed a series of new creep-resisting steels for turbine discs, rotors and blades—components which have to withstand high stresses at temperatures up to 800 deg C or even higher. Firth-Vickers 326 and 337 steels have been used in various forms, from blade stampings to large rotor forgings. "Rex 448" is a new ferritic steel for gas turbine components where service temperatures are not so high as to warrant the use of an austenitic steel. "Rex 467," another recent development, is an austenitic steel which has creep-resisting properties of a very high order, but which does not contain in its composition the more scarce and expensive alloying elements upon which good creep resistance usually depends.

Research continues on both sides, the metallurgical and the fabrication aspects. The problems of today are attacked on the basis of experience gained with the problems of yesterday, but they are no less acute than those which were overcome and culminated in that historic flight of the E.28/39 ten years ago.

FORTHCOMING EVENTS

Aug.	25.	Exeter Aero Club: Display.
Aug.	25-26.	Skegness Airport: Aerial Week-end.
Aug.	25-26.	International Air Circuit of the Dolomites, Italy.
Aug.	31.	Helicopter Association: "Operational Employment of the Piasecki Helicopter," by F. N. Piasecki. Lecture followed by Fifth Annual Dinner.
Sept.	1.	R.N. Air Stations Gosport and Lee-on-Solent: Air Display.
Sept.	2.	A.B.A.C. Summer Convention.
Sept.	3-7.	R.Ae.S. and I.Ae.S.: Third Anglo-American Aeronautical Conference, Brighton.
Sept.	3-8.	British Interplanetary Society: International Congress on Astronautics.
Sept.	9.	Society of Model Aeronautical Engineers (Northern Area): Model Flying Festival.
Sept.	10.	R.Ae.S.: 39th Wilbur Wright Memorial Lecture—"The Well-tempered Aircraft," by A. E. Raymond.
Sept.	10-16.	Battle of Britain Week.
Sept.	11-16.	S.B.A.C.: Flying Display and Exhibition, Farnborough.
Sept.	15-16.	International Rally, Parme, Biarritz, France.
Sept.	22.	*Daily Express* South Coast Air Race, Shoreham.
Sept.	25.	Milan International Grand Prix.
Oct.	4.	R.Ae.S.: Seventh British Commonwealth and Empire Lecture, "Air Transport in New Zealand and the South Pacific," by A. V-M. Sir L. M. Isitt, K.B.E., R.N.Z.A.F.
Oct.	31.	R.Ae.C.: Jubilee Ball.

Commercial Aviation Commentary

By ALLEN GALE

No. 5 of a New Series

WITH passenger load-factors running at around 60 to 70 per cent, the airlines still have quite a lot of leeway to make up in the matter of passenger sales. Especially is this going to be the case when "air-coach" travel spreads to this side of the hemisphere, since the enormous increase in offered seats cannot fail to reduce these load factors.

There is no doubt then that some pretty aggressive sales policies are required today and that there is plenty of room for new ideas. I have always wondered why the airlines take no advantage of their sizeable staffs in this connection. True, the commercial people are usually busy plying their trade, and no doubt the ticket agencies do their share to the best of their ability. But why not recruit the aircrew, the traffic staff, the office staff, the engineers and the operations officers to the sales department? Let them all try to sell seats and, when they do, give them an incentive bonus of, say, 5 per cent? In this way the airlines would save 2½ per cent over the normal agency commission, they would undoubtedly sell more seats and the employees would reap an additional financial reward in proportion to the good work they had done on behalf of their company. The adoption of such a scheme would cost the airline nothing, since payments would be made only on results; and it would certainly be a stimulant to company staff relations.

Since the whole matter would be an internal one, it is difficult to see why I.A.T.A. should object—or, for that matter, anyone else. All the airlines could do it and it would still be a good idea. I pass on this notion for what it is worth. If it's a bad one for any reason, obvious or otherwise, I should be greatly interested to hear why.

◆ ◆ ◆

IT has been said by one much wiser than I that the Englishman is perpetually confounded by his weather. It is always colder, hotter, wetter or drier than he anticipated, and he is always unprepared. On this account we have suffered endless years without universal central heating, our pipes freeze up with unremitting regularity every winter and our pioneers abroad sweat their hearts out in tropical climes whilst other nations laze in air-conditioned rooms around the corner. Snow usually sends us into a whirl, too, if it arrives in any quantity—and nowhere more so than on an airfield.

Typically, we have got by in the past with many improvised remedies, but now at last the M.C.A. has got around to ordering some snow-ploughs. These are of the rotary type which has proved so successful in Canada, and the U.S.A. and are being made under licence through an agreement between a London firm and an American one.

If our present luck with the elements persists, it looks as though they will be very useful next winter.

◆ ◆ ◆

THE introduction of the British Instrument Rating some two years ago was both necessary and desirable from everyone's point of view. It raised our pilot licences to as high a standard as is achieved in any other country, and it also served to improve the instrument flying of many people who, with no accent on this type of work, were in some cases a little out of date. With the many approach aids which are available in this country the M.C.A. were wise not to tie the examinee down to any one of these, and it was the candidate's choice which set the syllabus. As far as I remember, the aids which could be used in the test were S.B.A., Radio Range, I.L.S. and Babs.

Now I hear there is a proposal to include G.C.A. in the syllabus; and whilst, no doubt, the Ministry have given this matter careful thought, there are some queries as to the wisdom of this move. As most people are aware, G.C.A. is a talk-down system in which the pilot plays no part in the orientation of his aircraft to the landing position other than by obeying the instructions passed to him by the G.C.A. director.

In contrast to the other aids, in which the whole success of the operation depends upon the pilot's skill in converting the aural or visual signals which he receives into compass headings and changes of altitude, the pilot using G.C.A. has the simpler task.

It would seem, therefore, that since a separate part of the examination covers all aspects of general instrument flying, the use of G.C.A. will not tell the examiner the complete story about the candidate's ability to make an instrument approach. With due respect, the whole thing is a little reminiscent of taking a written examination with the answer-book propped up in front of one.

Whilst recognizing the value of G.C.A. as a primary aid, I still think it best if candidates were examined on those aids which require co-ordination between instrument flying and the reception of radio signals. In this way the examiner would get a better appreciation of the pilot's true ability at an important aspect of his job.

◆ ◆ ◆

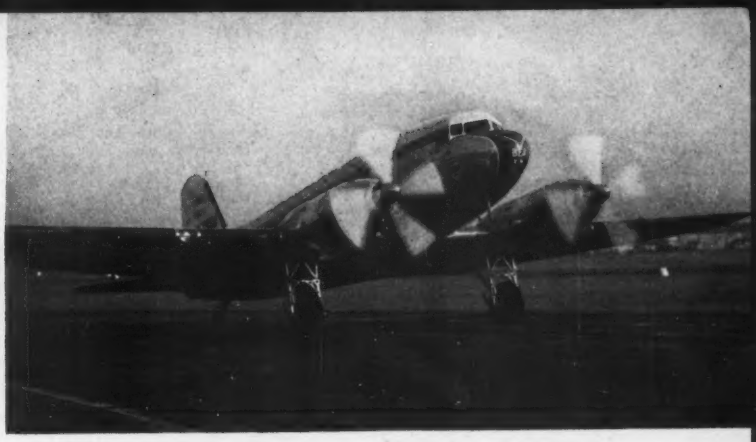
THE other day I happened to overhear a conversation between a businessman and one of the large airlines. He was enquiring about the delivery of a small parcel of his merchandise to the Far East. Somewhat to his surprise (and much to his disgust) he was told that there was "a minimum of three weeks' delay on this route." His subsequent remark to me was to the effect that there wasn't much point in using air transport when a ship could get there just as quickly. I countered by saying that the Abadan oil crisis had made fuel difficult to get in certain parts of the world, and in any case there was a big shortage of freight aircraft. This latter point he just couldn't understand, since he had heard that quite a lot of the charter companies were going broke, or had already gone that way, through lack of business.

There is no doubt that an anomaly exists somewhere, since no charter operator in this country would agree that his business prospects were wonderful or that the present crisis has brought him a great press of work. Apart from the very serious fuel shortage (for which no one can blame the aviation interests in this country), there is also a grave lack of long-distance aircraft suitable for the carriage of freight; and for this state of affairs we have ourselves to blame to some extent.

When one reflects upon the number of such aircraft which found their way on to the Berlin Airlift a bare two years ago, and which in many cases now lie rotting on the perimeter tracks of various airfields around the countryside, one is forced into the assumption that someone has bungled. Easy as it may be to assume wisdom after the event, there were many who pointed out at the time that such aircraft, and the companies who operated them, ought to be kept in existence since they constituted something of a national asset. Such advice was not heeded; many Lancastrians, Haltons and other ex-Service aircraft were allowed to fall into disrepair, to say nothing of others being sold abroad, such as the three Skymasters which belonged to Skyways.

Once again we are hoist by our own petard of careless planning or lack of foresight. Let us hope that those responsible for such matters will now recognize the value of an independent merchant fleet of the air and ensure that when matters revert to a more normal state that such free-lance companies as have helped in this crisis are kept alive, with their aircraft, to assist with the next.

CIVIL AVIATION



FIRST IN THE FIELD : R.M.A. "Sir Henry Royce," one of B.E.A.'s two Dart-powered Dakotas, taxying at Northolt last week before taking off to inaugurate the world's first turboprop freight service.

B.E.A.'s TURBOPROP FREIGHTER

ON August 15th, B.E.A. introduced what is, in effect, the first regular all-freight service in the world to be flown with turbine-powered aircraft. The Corporation's Dart-powered Dakota R.M.A. *Sir Henry Royce*, left Northolt for Hanover at 0830 hr with a cargo of 1,523 kg of Forces mail and newspapers; it reached its destination in 2 hr 12 min. The service will continue to be flown with a frequency of three times weekly. The aircraft is one of two which the company is using in order to gain experience with the Dart turboprops, which will later be fitted in the *Discovery* (Viscount) class now on order.

A comparison between the performance figures for the turboprop Dakota and the ordinary piston-engined version is particularly interesting. With Darts, a T.A.S. of 190 kt can be maintained at 20,000ft with throttles set to give 700 s.h.p. per engine; the ordinary Dakota cruises at 155 kt at 5,000ft on 600 b.h.p. per engine. The Dart-powered version reaches its optimum cruising altitude (20,000ft) in 30 min.

EFFECTS OF THE FUEL SHORTAGE

SPEAKING in Sydney on Sunday night, the chairman of Q.E.A., Mr. W. Hudson-Fysh, expressed the view that regular flights between England and Australia might have to be curtailed within a fortnight unless petrol supplies in India and Pakistan showed some signs of improvement. Because of this petrol shortage all freight services have already been suspended in both directions, and the delivery of aircraft to Australia has also been stopped.

U.S. OVERSEAS ROUTE CHANGES ?

IT is reported from Washington that Pan American Airways have applied to the Civil Aeronautics Board for the grant of a permanent certificate to operate to all of the points in Europe, Scandinavia, and the Middle and Far East which the company is now serving under temporary authority. The trans-Atlantic operating rights of Pan American and T.W.A., which were granted by the U.S. Government in 1945, are due to expire next July and the C.A.B. is already having to study the problem of what is to be the U.S. overseas route pattern after that date.

Pan American's application is being strongly contested by T.W.A. who, although agreeing that their competitor should serve northern Europe, nevertheless consider that P.A.A. flights should be excluded from points in Spain, France and Italy. Pan American, on the other hand, have not requested that any of their competitor's services should be eliminated, but have asked the Board to take action on several of their own previous applications. One of these demanded that Nice should be made a co-terminal with Marseilles, so that both points could be served on flights from Rome and Lisbon. Permission was also being sought to fly between Lisbon and Dakar (*via* Casablanca) and to serve Kuwait, on the Persian Gulf. The question of calling at London and Lisbon does not arise, as the company already has permanent authority to operate to these two points. So far as the U.S. Government is concerned, Pan American has also been authorized to serve Moscow, and flights will be introduced as soon as permission from the Russians is forthcoming.

DE HAVILLAND'S LATEST ENTERPRISE

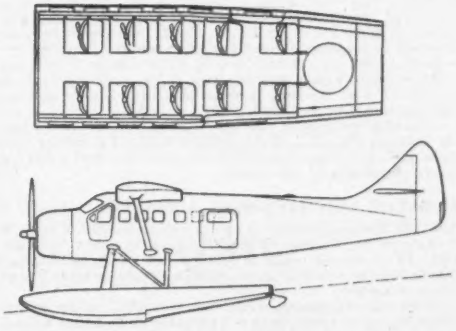
SOME preliminary details have now been released of the new de Havilland DHC-3, or King Beaver, a promising general utility machine of which a prototype is now being constructed by the de Havilland Aircraft Company of Canada Ltd., at Toronto. The aircraft is largely a "scaled-up" version of the ordinary DHC-2, which is already in service in several parts of the world. The main external differences in its general layout are seen in the type of undercarriage fitted, in the provision of additional windows and in the rounding of the fuselage side-panels.

Although intended for the same type of work as the original Beaver, the DHC-3 is really a much larger aircraft. The span is 10ft greater and the fuselage is 12ft longer. It has a provisional gross weight of 7,200 lb and will carry a useful load of up to 3,200 lb at a cruising speed between 128 and 165 m.p.h. over stages of 300 to 500 miles. An estimate of its maximum range is 1,100 miles. A spacious cabin will provide seating capacity for up to 14 passengers. Before putting the aircraft into production the manufacturers intend to sound the market for potential demand.

Primarily, therefore, the King Beaver is a robust bush transport, designed to operate from almost any type of surface. Edo 7170 floats will be fitted to the seaplane version, which will then have a gross weight of 7,540 lb. Most of the flying characteristics of its smaller predecessor will be retained, although its heavier payload will obviously necessitate a considerably more powerful engine if it is to have the same exceptional ability as did the DHC-2 to take-off from small lakes or river reaches.

For the new power unit, de Havillands have chosen the well-tried Pratt and Whitney HR-1340 Wasp, similar to that fitted in the Harvard and the Norsemans, but with a reduction gear of 0.67 : 1 ratio. The rated output is 600 h.p.

The King Beaver does not really represent any new line of thinking on the part of the makers. Even two years ago the company was trying to interest th R.C.A.F. in this type. Being well equipped with Norsemen, the Service did not show much interest at that time. Now that the Norseman is beginning to show signs of ageing, de Havillands feel that "the seed is fit for sowing" and that military acceptance of the machine might also open the way for a number of civil orders. Although no prices have yet been quoted, it is estimated that the landplane version will sell for about $50,000.



The cabin drawing of the 10-passenger version of the Canadian de Havilland DHC-3 King Beaver (described on this page) indicates the roominess of the accommodation available. All seats fold back on walls or bulkheads to facilitate cargo loading. The profile of the aircraft itself suggests the rugged construction necessary for "bush" work.

INAUGURAL FLIGHT: The honour of being the first European airline to introduce the new Douglas DC-6B goes to Swissair, who first used one of two recently delivered aircraft of this type on their Zurich-New York service last Saturday. At London Airport two days previously we took part in a demonstration flight, which, though brief, gave a very fair idea of the high standard of comfort and improved performance which Douglas has achieved in this new potential money-maker.

CIVIL AVIATION . . .

EASIER INSTRUMENT RATING RENEWALS

INDICATIVE of the extremely co-operative attitude which—contrary to the fears of many—the M.C.A. has adopted towards the subject of instrument ratings for commercial pilots, is the information contained in the recently published *M.C.A. Information Circular* No. 105/1951, entitled *Instrument Rating Renewal Tests*. It points out that, having further considered the character and scope of the annual flying tests which instrument-rated pilots must pass, the Ministry has decided that in future such tests may be conducted—at the pilots' own choice—either by official examiners in aircraft of the Ministry's Flying Unit, or by examiners nominated by firms and approved by the M.C.A. under a scheme announced in *Information Circular* No. 75/1950.

When conducted by an "approved examiner" the test may be carried out in the course of normal operations and, if preferred, may even be spread over more than one flight. In the case of scheduled airline flights, the instrument-approach test may be combined with one of the twice-yearly tests which pilots are required to undergo in accordance with the Regulation 38B of the Air Navigation Regulations. The use of two-stage amber is no longer considered necessary and any device which suitably restricts the candidate's vision is permitted. While the "approved examiner" scheme is designed mainly to meet the needs of the larger operators, there is nothing to prevent a number of smaller concerns who use the same type of machines from combining to nominate a suitable pilot for approval as an examiner.

The rating renewal tests are conducted in four phases. The first, concerned with basic manœuvres, includes pre-flight action, checks, take-off, climb and climbing turns on to given headings, and level flight after the candidate has been placed "under the hood" at a height of 300ft. The second phase requires a demonstration of ability to carry out radio-range procedures, including a two-minute "race-track" holding pattern on either the radio range station, an M.F. non-directional beacon with A.D.F. equipment, or a radio-range fan marker. If radio range is the aid selected for the instrument approach, the Phase 2 test is not required. For the third phase, the pilot must carry out an instrument approach using a choice of radio range, a non-directional beacon associated with radio compass, ground D/F (using QDMs), S.B.A. or I.L.S. Finally, the candidate must demonstrate a successful overshoot procedure and climb away at a specified rate on a stated heading. The degrees of accuracy required are to within plus or minus 5 deg, 5 kt and 100ft in smooth air. Due allowance is made, however, when the tests are flown in turbulent conditions.

Incidentally, it appears that the Ministry is now considering the inclusion of G.C.A. in the syllabus for Phase 4, and the Civil Aviation Commentary this week (p. 232) contains some discussion on the desirability of this measure.

GERMAN AND JAPANESE AIRLINES

IN view of the important part which civil aviation now plays in the economic structure of world trade it is, of course, inevitable that, after a suitable period of political and social readjustment, there should be a re-birth of air transport organizations in former enemy countries.

In the case of Germany, recent reports suggest that the present Allied ban on powered flying will probably be rescinded by next spring, thus enabling existing plans for the creation of a new German civil airline to be brought to fruition. It seems unlikely, however, that the pre-war Deutsche Lufthansa will be actually replaced, as the establishment of a purely German company is ruled out of the question for both financial and technical reasons.

The present proposals of the German government envisage an arrangement under which a number of smaller foreign airlines already operating into Germany would be invited to form an international company, with local participation. In this connection, it is believed that the German authorities have singled out Scandinavian and Swiss operators to have the first refusal of such an opportunity. Airports would be staffed by German personnel and the West German government would also apply for licences to construct foreign-designed machines locally.

A somewhat similar arrangement is understood to have already reached an advanced stage of planning in Japan. For some time the question of establishing a Japanese domestic airline has been under review, and a number of American and other operators have considered a scheme to pool equipment and capital to form the operational component of an airline to be known as Japanese Domestic Airline. This company would—until Japan's status under the Potsdam agreement is reviewed—have exclusive commercial rights for all internal services within Japanese territory. The Japanese element, to be known as Nihon Koku Kaisha, would provide booking office and traffic handling facilities, while aircraft and crews would be chartered from the foreign component of the organization.

The companies which to date have signified their intention of participating are P.A.A., N.W.A., P.A.L., C.P.A.L. (who would actually be a sleeping partner and would not contribute equipment) and C.A.T. Originally B.O.A.C. and Qantas were invited to take part, but they recently dropped out of the plan, mainly because of a shortage of equipment. It is interesting to note, however, that G/C. Paul Ruston, who was originally in charge of B.O.A.C.'s Tokyo office, has accepted an offer to be managing director of the new Japanese airline.

B.E.A.'s FIRST AMBASSADOR

AS we go to press we learn that it was planned to hand over the first Airspeed Elizabethan to B.E.A. on Wednesday, August 22nd. The machine is ALZN and the ceremony was to have been at London Airport at 10 a.m.

After a short period for completion of training the aircraft will be introduced on B.E.A.'s services, and a target date of September 3rd is in mind. Several captains and first officers are already fully conversant with the Elizabethan class, but it seems probable that on its first service, Capt. W. Baillie will be at the controls. The second machine for B.E.A. will, in effect, be delivered via Farnborough, where it will spend a few days as Airspeed's exhibit at the S.B.A.C. Display and Exhibition before being handed over to the Corporation. This will be the third production aircraft, ALZP.

The completion on August 10th of acceptance trials of the flagship of the Corporation's new fleet, *Elizabethan*, was marked by a number of full-scale passenger flights from Northolt. On the first sortie lunch was served to some 40 B.E.A. and Airspeed passengers as the aircraft cruised at 20,000ft to the Isle of Man and back. Later in the afternoon a full load of B.E.A. executives, including Lord Douglas of Kirtleside and Mr. Peter Masefield, flew over the same route. After a return to Hurn the same evening, the trials concluded with some night flying to check the handling of the aircraft under simulated engine-failure conditions during take-off, approach and overshoot.

On Monday, August 13th, the production prototype, G-ALFR, *Golden Hind*, left Hurn for Khartoum, where it is carrying out tropical trials. Khartoum was reached in a flying time of only 12 hr at an average ground speed of approximately 260 m.p.h. On the first stage of this flight—that between Hurn and Rome—the Ambassador recorded a block-to-block time of 3 hr 51 min, an average of 246 m.p.h. for the 930-mile stage. Cruising at 20,000ft at 1,175 b.h.p. per engine, the machine recorded a T.A.S. of between 240 and 250 m.p.h. The fuel consumption was 588 gallons,

. . . , h & c, and the usual offices . . .

WE have their word for it that the coldest place on earth is a Russian whistlehalt known as Verkhoyansk (never mind, for the moment, *who* invented the thermometer) where the annual range of temperature is anywhere between –75°C. and 75°C. Out-of-doors, of course.

For a really cold climate *indoors* dear old Britain takes a lot of beating. Why, I can remember as clearly as if it were yesterday . . . correction, the day *before* yesterday . . . but I digress.

Anyway, you can take it from me and the reference library that temperatures of –70°C. on the ground are not uncommon in the Arctic. You can also take it that even lower temperatures (–90°C., for example) are experienced at great heights in the Tropics. The higher, the fewer—as any gas turbine-engined aircraft will tell you.

Now let's change the subject.

One of the *hottest* spots on earth is the cockpit of an aircraft parked (at ground level) in the full glare of the Tropic sun . . .

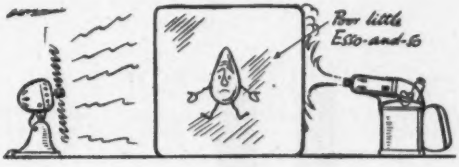
. . . . 50°C. . . . . 60°C. . . . . even 70°C.

Now that's an awful lot of temperature, especially if you've just cruised down from the chilly stratosphere and environs, but it's what modern aircraft and aircraft fuels have to put up with.

Let's get more complicated. The pressure of the atmosphere varies with altitude : at sea level it's 14·7 lb. per square inch ; at 50,000 feet it's just over 1·5 lb. per square inch ; at 50 miles there's still enough oxygen to kindle meteorites. (That's all right : an occasional *non sequitur* never hurt anyone.)

Well, aircraft plough through the atmosphere whatever its pressure, and the faster they travel the harder the ploughing. The impact of a fast-moving aircraft on air steps up local pressure and temperature to a remarkable degree centigrade. . . . If you want it straight from the shoulder it's like this : the rise in temperature in degrees centigrade is roughly equivalent to the square of the speed of the aircraft in hundreds of miles per hour. Get it ? At 600 m.p.h. the rise is 6^2 : that is 36°C. Child's play, really.

That's enough. Now we know what modern gas turbine fuels are up against, what extremes and changes of atmospheric pressure and temperature they must withstand. How do they manage it ? How do they



contrive—faced with these alarming vicissitudes—to remain chemically stable, to stay in the tanks, and to flow sweetly, when necessary, between tank and engine ?

For the answers we must go to the Esso laboratories where mad-keen scientists, cunningly disguised as human beings, work beaverishly to find new solutions for new problems. Aircraft fly higher, farther, faster . . . and look to the Esso labs. to provide the fuel for the job.

The speed and certainty with which these scientists work is roughly—*very* roughly—equivalent to the square on their hypotenuse . . . which is really only another way of announcing that . . .

It pays to say

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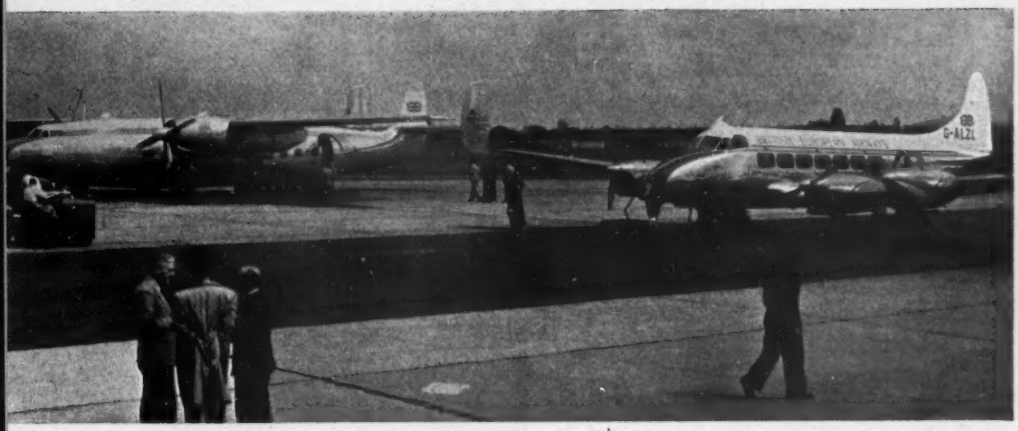


KEEPING COMPANY: "Elizabethan," the first Ambassador to go into service with B.E.A., poses on the tarmac at Northolt alongside the prototype de Havilland Heron which is at present being used experimentally on week-end services to the Channel Isles.

CIVIL AVIATION . . .

which still left some 400 gallons in reserve. A refuelling stop of two hours was made at Rome and the aircraft left at 0058 hr for El Adem. From this point it flew direct to Khartoum, with Wadi Halfa designated as a possible refuelling stop if conditions were unfavourable.

The pilot in charge of the tropical trials programme is Mr. Ron Clear, with Mr. B. A. Powell, also of Airspeed's, acting as co-pilot. The *Golden Hind* carried—including a flight-crew of four—a complement of 21 aircrew, technicians, inspectors and observers. The take-off weight on the departure from Hurn was within a few pounds of the maximum a.u.w. of 52,500 lb.

AUTO-PILOT IN is obviously the order of the day as Capt. W. Baillie relaxes at the controls of B.E.A.'s "Elizabethan" during one of the acceptance trial flights described in the news-item above.

BREVITIES

THE British Independent Air Transport Association has now formally confirmed the appointment of Mrs. E. Whittaker as its secretary.

* * *

A new fortnightly service linking Nicosia, Beirut and Kuwait was introduced by Cyprus Airways on August 1st. The company, which is based on Nicosia, operates a fleet of Dakotas.

* * *

The Columbian airline, Avianca, has been ordered by the Civil Aeronautics Board of Ecuador to cease operations in that country with effect from September 1st. Services were actually curtailed from August 1st.

* * *

Trans-Oceanic Airways, who operate Solents, have announced plans for a daily direct flight between Sydney and Hobart. The company hopes that the service will begin this month. There is also a further plan to operate an inter-state service in Tasmania with smaller flying boats.

* * *

Extensive improvements are now under way at Dorval, the airport for Montreal. The north-east and south-west runways have now been extended from 5,000 to 7,000ft and are being resurfaced with macadam and asphalt; I.L.S. will be provided on the two longest runways.

* * *

At present B.O.A.C. has no fewer than 333 aircrew members who have flown more than 1,000,000 miles. Of this total 29 are double mileage-millionaires, and one pilot, Capt. O. P. Jones, has even exceeded the three-million-mile mark. For the statistically minded, the 333 have spent 273 years in the air.

* * *

Mr. Misha Black, a director of the Design Research Unit, will advise B.O.A.C. on the design of equipment to be used in the Corporation's new maintenance base, now under construction at London Airport. He will supervise the design of such units as instrument repair benches and will assist in the visual co-ordination of test equipment.

* * *

Civil aviation officials from Ceylon, India, Indonesia, Pakistan and Siam have been invited to visit Australia with the object of determining to what degree Australia may assist in the training of civil aviation personnel from the south-east Asiatic countries. The visits are the result of the Commonwealth technical co-operation programme which was the outcome of the Colonial conference held at Colombo last year.

* * *

Representatives of all international and national airlines operating through India agreed at a conference in New Delhi on August 14th to reduce by one third the amount of aviation fuel to be supplied to their aircraft at landing grounds in India. This action is designed to alleviate to some extent the oil shortage caused by the closing of the Abadan oil refineries; the arrangement was effective on August 20th.

CLUB and GLIDING NEWS

AS in previous years, the Association of British Aero Clubs and Centres has again chosen White Waltham as the venue for its annual Summer Convention. The date is September 2nd and the starting-time is 1430 hr. Following the usual practice, there is to be no display or flying demonstration, the purpose of the event being simply to provide a social occasion on which all flying club members and those interested in the private-flying movement may get together for informal chats on their mutual interests.

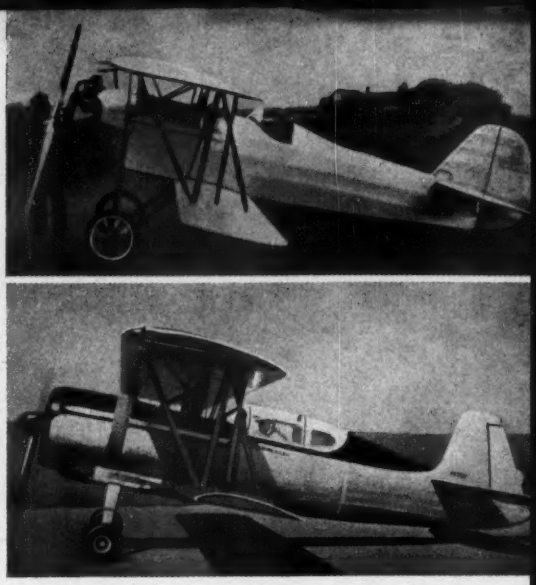
The friendly "tea-party" atmosphere of the A.B.A.C. Convention usually attracts a large number of visitors, most of whom arrive by air, and the visiting aircraft park at White Waltham should provide a fairly representative collection of most types of British sporting aircraft of the past quarter of a century.

There will be an arrival competition, for which the first prize, a table-model radio, will be awarded to the pilot of the aircraft landing nearest to a sealed time between 1400 and 1445 hr; additional prizes will also be presented in connection with this event. Afternoon tea will be available at 2s 6d per head and—something which has proved an attraction in previous years—an extension of bar hours is also being obtained. Should they be required, further details may be obtained from the A.B.A.C. at Londonderry House or from any flying club.

A PLEASING absence of formality marked the "At Home" organized by the Yorkshire Aeroplane Club at their Sherburn-in-Elmet base last Sunday. In delightful flying weather some14 aircraft arrived from various clubs, bringing a total of 39 visitors, who, later in the afternoon, enjoyed the "reet good fare" provided by their hosts at afternoon tea. The colourful line-up of visiting aircraft was seen to include ten Austers, one Messenger, one Magister, our own Gemini and a Taylorcraft from York, whose pilot, Mr. E. F. Norris, was presented with a silver tankard for having landed nearest to a sealed time of arrival.

We heartily agree with Yorkshire's chairman, who suggested that each Sunday in the year should see at least one club acting as host at gatherings of a similar nature.

ONE of Britain's best-known gliding organizations, the Surrey Gliding Club, has had to move its base from Redhill to a new home at Lasham airfield, near Alton, Hampshire. The club had been in residence at Redhill for more than four years, during which time it has been operating in conjunction with the Imperial College Gliding Club. The move was necessitated by the fact that the R.A.F.V.R. now wishes to make increasing use of Redhill. Most of the Surrey club's nine sailplanes will be aero-towed to Lasham, though one of the three machines owned privately by members celebrated the move in fine style last Saturday with a soaring flight of 3 hr. 45 min. to its new base; the pilot was Mr. Jack Karran.



BEFORE AND AFTER: An American private owner, Mr. E. M. Smith, has completed what appears to be an outstanding conversion job on a home-made 1933 biplane (upper photograph). At a cost of $1,000, he fitted a 145-h.p. Warner engine, a BT-13 cockpit and a Cessna 140 landing gear; the result was the clean-looking machine seen in the lower photograph. The aircraft now cruises at 125 m.p.h.

S.G.C. will be particularly sorry to have to lose the services of Mr. Lorne Welch, who has worked as full-time C.I., ground engineer and secretary throughout the period of the club's stay at Redhill. He has now relinquished these posts but will, of course, retain his connection with the club. The new C.I. is Mr. Paul Blanchard, and Mr. Malcolm Laurie will act as secretary. Mrs. Ann Douglas, who originally founded the club in 1938, is to continue as its chairman.

This week's gliding news, unhappily, must conclude on a serious note by recording the death of one of the best-known personalities in the British gliding movement. While flying a privately owned sailplane at Dunstable last Sunday, Mr. Jack Hanks, the 42-year-old resident instructor at the London Gliding Club, lost his life in a collision with an Olympia which was also flying over the club's site. Mr. Hanks had recorded about 400 hours of gliding since learning to fly with the club in 1947. The Olympia, flown by Mr. J. G. Murray and owned by the South Downs Gliding Club, landed safely, although it had lost almost four feet from one wing tip.

RADLETT MODEL RALLY

HELD at the Handley Page airfield at Radlett last Sunday by permission of Sir Frederick Handley Page, the Festival of Britain All-Herts Model Aircraft Rally, organized by the St. Albans Model Aero Club, attracted a crowd of 10,000 and was favoured by fine though windy weather.

Among the more unorthodox models which caught our eye was Mr. G. Cole's *Ghoul III*, a "flying wing" of experimental design powered by a 1 c.c. diesel engine. Another contestant with an eye to the future was Mr. Newton, of Kent, whose flying ambulance was unanimously adjudged the winner of "the most outstanding model" entered in the *concours d'elegance*. A special prize was awarded to him, as his model was unable to comply with the rules of this particular class, which stipulate that the winning machine must make a flight of at least 30 sec duration. Representing a machine which could be used both in the air and on the road, Mr. Newton's model has a "telescopic tail unit," the single boom sliding into the roof of the cabin, whilst the wings can be dismantled. The interior is spacious, accommodating four stretchers, and the model generally shows an exceptionally high standard of skill and patience on the part of the maker who, incidentally, is an ambulance driver.

This futuristic "flying ambulance" was seen at Radlett last Sunday.

Among the jet contingent was Mr. J. Hall's control-line model, which, powered by a "Dyna" pulse-jet of 4½ lb thrust, can achieve 125 m.p.h. Another similar model was that built by J. Claydon and W. Dunn, which won first place in the world's model flying championships in Belgium a short time ago.

Entries for the radio-controlled contest were, perhaps, a little disappointing, partly owing to the fact that these machines had to combat headwinds very often greater than their own speed.

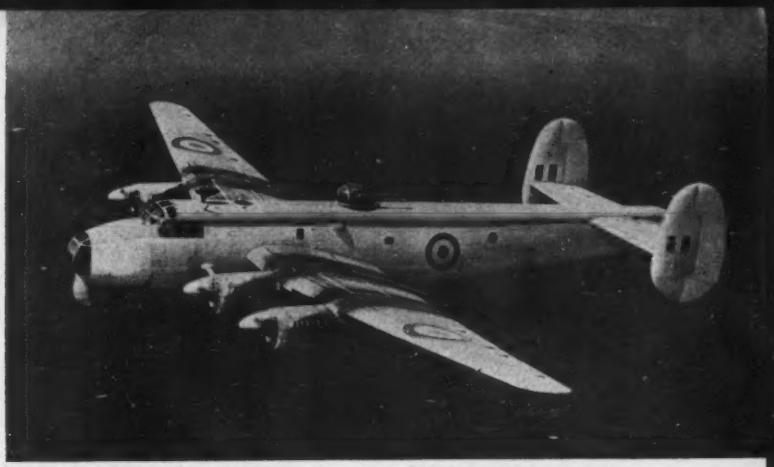
The control-line speed competitions, which are divided into four classes, produced some excellent results. Mr. M. Billington established a new British record (subject to confirmation) of 96.82 m.p.h. in Class 1 (engines of up to 2.5 c.c.), whilst Mr. P. Wright retained his world's record in Class 2 (up to 5 c.c.) with a speed of 124.9 m.p.h. Class 3 was also won by Mr. M. Billington with a speed of 124.3 m.p.h. for a model driven by a 10 c.c. engine.

In the *concours d'élégance* Mr. Henderson won in the class for gliders; the prize for the control-line model went to Mr. A. Briggs for his beautifully finished B.17 G.

The prizes were presented by the Mayor of St. Albans.

SERVICE AVIATION

Royal Air Force and Naval Aviation News



MARITIME EXPLORER: Alfred Noyes's line, "There's a magic in the distance where the sea-line meets the sky" is singularly appropriate for this latest photograph of the Avro Shackleton.

Commonwealth Forces in Korea

AFTER having acclimatized themselves to their new Gloster Meteors, the pilots of No. 77 R.A.A.F. Squadron are back on operations in Korea. The first operation was a fighter sweep down the Yalu river area.

Apart from fighter/interceptor duties, No. 77 also provide fighter escorts for U.S.A.F. bombers. No. 426 Squadron, R.C.A.F., has completed one year's service in Korea. In the 12 months this transport unit has carried over 6,600 passengers and nearly 2,700,000 lb of freight between the west coast of Canada and Japan. The first C.O. was W/C. C. H. Mussells, D.S.O., D.F.C., but he handed over to W/C. J. K. Macdonald, an ex-Coastal Command pilot, in June this year.

The first flights of the squadron's North Stars were made over the northern route *via* Elmendorf Field in Alaska and Shemya in the Aleutians. One-way mileage of this route totalled just under 10,000. Adak, in the Aleutians, has also been used as a stopping point on the northern route, but No. 426 has flown the mid-Pacific route *via* San Francisco and Hawaii, with stops at one of several small islands between Hawaii and Japan, including Johnson, Wake and Iwo Jima.

During the critical days of the Korean war No. 428 was running a once-a-day service with only 12 aircraft on its strength. A slip-crew system was adopted, the change over being made at either Shemya or Adak. The pace has now eased to 15 trips a month.

Naval Air Appointments

CAPT. (E) R. P. TARGETT-ADAMS has been appointed to the Admiralty for duty with the Director of Aircraft Maintenance and Repair, and Capt. H. A. Traill, C.B.E., also goes to the Admiralty as Director of Air Equipment and Naval Photography. Capt. G. C. Dickins is to command R.N.A.S. Machrihanish when it re-opens in the near future.

Charity Ball

THE DUCHESS OF KENT has promised her patronage for a ball at Phyllis Court Club, Henley-on-Thames, on September 14th, to be organized by the Royal Air Force Aid to Greece Committee to collect funds and comforts for the assistance of a Greek village destroyed during the war.

Lady Slessor is chairman of the committee; during her recent visit to Greece she met the Queen of the Hellenes and the head of the R.A.F. Mission in Greece—and the stories she heard of Greek suffering, first during the war and again at the hands of the Communists, led her to seek means to befriend the villagers.

She discussed her plans with the Queen of the Hellenes and with several senior officials at the Air Ministry, and it was decided to appeal to the Service for help.

During the evening the proceeds of the ball will be handed by Lady Slessor to the Greek Ambassador in London, M. Leon V. Melas.

FIRE AND BRIMSTONE: A "Flying Cheetah" Mustang of the S.A.A.F. in Korea is framed by the napalm tank and 5-in. rockets of another of the squadron's aircraft.

R.A.F. Appointments

AIR VICE-MARSHAL J. D. I. HARDMAN, C.B., O.B.E., D.F.C., until recently the Commandant of the Royal Air Force Staff College, Bracknell, Berkshire, has been appointed Senior Air Staff Officer, Home Command. He took up his new duties on August 9th.

The present Deputy Director of Organization (Forecasting), Air Ministry, A. Cdre. R. C. Field, is to be Director of Administrative Plans from September 1st. Before going to the Ministry as D.D.Org.(F.) he was S.A.S.O. at the Central Photographic Establishment.

The new S.A.S.O. at Transport Command is A. Cdre. W. H. Hutton, C.B.E. He comes from the Air Ministry, where he has been Deputy Director of Personnel since 1948. Prior to this he was S.A.S.O. at A.H.Q. Ceylon.

Pacific Island Air Guard

THE AUSTRALIAN MINISTER for Navy and Air recently announced that the R.A.A.F. has decided to station an Avro Lincoln from No. 10 R.A.A.F. Squadron indefinitely on Momote. This move follows a number of reports of pillaging by Japanese in the islands near Manus.

No. 604's New C.O.

S/L. A. DEYTRIKH, the Air Ministry announces, has been appointed to command No. 604 (County of Middlesex) Squadron, R.Aux.A.F.

Since joining the R.A.F. in 1940 S/L. Deytrikh has had unusually varied experience. He flew on active service with No. 66 Squadron, later as a flight commander. In 1944 he had a spell with Supermarines as a test pilot and then served in Intelligence with the Control Commission in

SERVICE AVIATION . . .

Germany and Allied Air Co-operation and Foreign Liaison.

In 1947 he relinquished his V.R. commission on appointment to his present squadron.

Model Competition

THE RECENT aircraft-model contest held at Wiesbaden between the U.S.A.F. "Wings and Wheels" club and B.A.F.O. Model Aircraft Association resulted in a win for the latter by 96 points to 63.

Britannia Shield Competition

SIX COUNTRIES—Belgium, Holland, Norway, France, Greece and the U.S.A.—have each promised to participate in the Britannia Shield Competition this year. The U.S.A. will draw its team from occupation forces in Germany.

This year's events will consist of shooting, swimming and boxing and the finals will be held as follow: Boxing, Empire Pool, Wembley, October 3rd; swimming, Eltham Baths, October 2nd (evening); shooting, Bisley, October 3rd.

The Britannia Shield commemorates the comradeship of the various nationals who took part in the Battle of Britain and the Shield itself is made from oak taken from the damaged fabric of London Guildhall.

All gate receipts go to the Britannia Shield Scholarship Fund, administered by the R.A.F. Benevolent Fund. Last year's contribution was £600.

Fighter Command Tie

A TIE HAS been designed for wear exclusively by officers who are, or have been, on the posted strength of H.Q. Fighter Command. The *motif* is the Fighter Command badge on a dark blue background.

Canadian Air Defence

A NEW R.C.A.F. fighter base was added to the Canadian network of fighter stations when Bagotville, Quebec, about 100 miles north of Quebec, was reopened recently.

Bagotville served in the last war as an operational fighter base and advanced flying training centre; it is now commanded by a Battle of Britain veteran, W/C. Beverley E. Christmas.

Heligoland Bombing Range

THE Government having promised to return Heligoland to the Germans by next March, a search has been made for suitable alternative sites.

Sandbanks off the Lower Saxony and Schleswig-Holstein coasts have both been suggested and the Federal German Government consider the Lower Saxony sites to be the most suitable.

No. 1 Basic Air Navigation School

COMPLEMENTARY to the pilot-training schools for National Service aircrew are the new Basic Air Navigation Schools for teaching navigation. The first of these is established at Hamble, Hants, where three courses, totalling 48 pupils, are now running concurrently. This new school is part of Home Command and, although operated and maintained by Air Service Training, Ltd. (a member company of the Hawker Siddeley Group), it is commanded by S/L. W. M. Mason, D.S.O., D.F.C., and other R.A.F. officers, who are responsible for discipline Service administration and overall supervision. A.S.T., under the direction of their chief instructor, W/C. H. F. Jenkins, O.B.E., A.F.C., are responsible for all navigational training both in the air and on the ground.

Pupils come to the school at the end of their 12-week course at an initial training school and stay at the B.A.N.S. for 30 weeks. Their rank is that of acting pilot officers; most of them are between 18½ and 19 years of age.

The main aims of the course are to teach the pupils all the primary navigation processes and to make them familiar with the construction, use and maintenance of the instruments and aids available to the navigator; personal qualities are developed and training as general duties officers is continued.

In view of the extent and complication of the subject-matter to be absorbed in a short time, it has been found necessary to attempt a new approach. Instead of a series of concentrated classroom studies, the students are given a sound and practical knowledge of the basic drills and manipulation of all their equipment.

Of the 30-week course, leave takes up two weeks and 103 hours' flying in Anson 21s is put in. Practical work takes up 479½ hours of a pupil's time and another 258½ hours are devoted to lectures. This time is allocated in the following manner:—

Subject	Lectures hrs.	Practical hrs.	Total hrs.
Navigation	124	195	319
Weapons	13	19	32
Meteorology	24	10	34
Radio	20	23	43
Airmanship	27½	23½	51
G.D. officer training ...	37	4	41
Drill and ground combat ...	5	31	36
Physical fitness	—	56	56
Games and leadership	—	78	78
Commonwealth studies and English	8	12	20
Arrivals, public holidays ...	—	28	28
	258½	479½	738

Those who successfully complete their basic navigation course go on to a more advanced training course with Flying Training Command.

A.A.F.C.E. Appointment

THE Canadian Minister of National Defence, Mr. Claxton, has announced that A. V-M. J. L. Plant, R.C.A.F., has been selected to serve as Assistant Chief of Staff (Personnel and Logistics) to Lt. Gen. Norstad, Commander of the Allied Air Forces in Central Europe.

Reunions

THE sixth annual reunion dinner of No. 3 S. of G.R. (Squares Gate) will be held at the Casino, Blackpool, on October 6th. Particulars from Mr. A. C. M. Powell, Monerey, 26, North Promenade, St. Annes-on-Sea, Lancs.

On Saturday, September 22nd, the fifth reunion for members of No. 219 Squadron and Nos. 6219 and 6029 Servicing Echelons will take place in London. S/L. D. W. B. Farrar, R.A.F., Coltishall, Norfolk, will furnish details.

Details of the proposed reunion dinner to be held by R.N.A.S. Eastern Mediterranean 1914-18 on October 20th may be had from A. G. Furlong, 29 Kenton Park Avenue, Kenton, Harrow, Middlesex.

LEARNING THE WAY OF THINGS: Some studies from No. 1 B.A.N.S. at Hamble. (Top row) One of the Anson 21s used as flying classrooms—two pupils are carried in each; pupil navigators in the flight planning room; the Commanding Officer, S/L. W. M. Mason, D.S.O., D.F.C. (Bottom row) Two students boarding an Anson to practise the B.A.B.S. approach system; watching the B.A.B.S. indicator as the Anson approaches the beacon at Calshot Spit; a trio try their hand at "shooting" the sun.

"Flight" photographs

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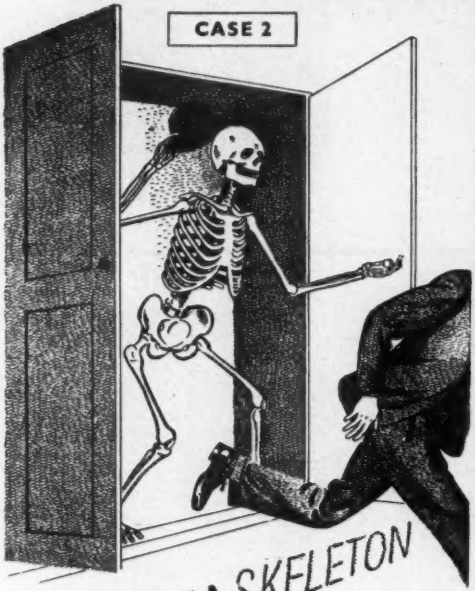

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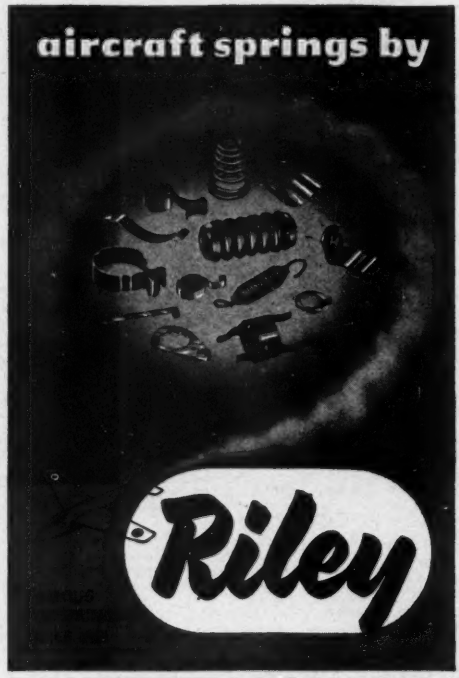

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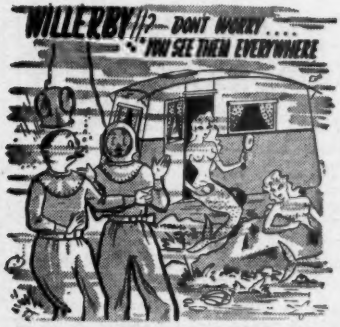

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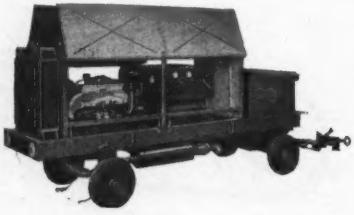

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THE proprietor of British Patent No. 590735, entitled "Improvements in Helicopter Aircraft," offers same for licence or otherwise to ensure its practical working in Great Britain. Inquiries to Singer, Stern and Carlberg, Chrysler Building, New York 17, N.Y., U.S.A. [6807

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SITUATIONS VACANT

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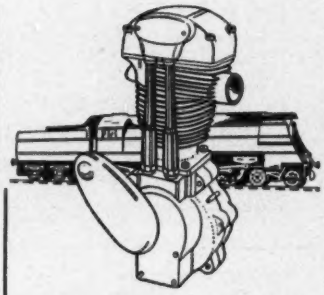
VACANCIES exist at the Ministry of Supply factory, Windscale Works, Sellafield, for research and experimental mechanics capable of carrying out the repair of electronic instruments.

WAGES 134/9 for a 5-day week of 44 hours plus merit pay according to ability and experience up to 36/- a week from date of entry. Selection for posts carrying merit pay up to 42/- a week will be made after entry.

APPLY, giving details of apprenticeship, training (including Forces' training), qualifications, and experience, to the Senior Labour manager, Windscale Works, Sellafield, Cumberland. [6817



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Alongside, and complementary to our Aircraft Division, our engine sales have shown a steady and healthy rise, and we are now stocking most of the more popular types of aircraft engines and are in a position to supply some of the lesser known varieties in addition. Such odd types as the Warner Superb Scarab 50 for the Cessna Crane, de Havilland Gipsy III for the Puss Moth, etc., and the Ranger for the Fairchild Argus being some of the more interesting of which we hold single items only, but of the Gipsy Majors, Cheetahs, Gipsy Six I, etc., etc., etc., our stocks are enormous.

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HANDLEY PAGE, Ltd., have vacancies for:

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WIND tunnel technicians with 1st or 2nd class Hons. degree and with experience in or preference for wind tunnel work.

JUNIOR stressmen of degree standard. Experience preferred but not essential.

SENIOR design and intermediate draughtsmen, preferably with aircraft experience, for their Cricklewood and Radlett offices. Consideration will be given to applicants with experience in light structural or mechanical engineering. Possession of O.N.C. or H.N.C. (mech. or elect.) an advantage.

LOFTSMEN with previous experience in full-scale layout work or similar workshop practice. These vacancies are at Cricklewood only.

APPLICATIONS, stating age, qualifications and details of experience, to: Staff Officer, Handley Page, Ltd., Cricklewood, London, N.W.2. [6790

THE DE HAVILLAND AIRCRAFT Co., Ltd.,

HAVE vacancies for

SENIOR design and intermediate draughtsmen (preferably with aircraft experience) in their Hatfield and London (Regent Street) offices.

APPLICATIONS, stating age, experience and salary required to:

CHIEF Draughtsman, The de Havilland Aircraft Co., Ltd., Hatfield, Herts. [6535

APPLICATION invited for vacancies existent within maintenance section of Viking charter operator, as under. All appointments permanent.

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ENGINE and airframe fitters.

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BASIC wage scale: Grade "B" £7 15s.; Grade "A" £8 5s. Normal overtime emoluments and licence payments etc. Appointment by letter only, to Chief Engineer, Trans World Charter Ltd., Bovingdon Airport. [6800

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APPLICATIONS to the Personnel Officer, Normalair, Ltd., Yeovil, Somerset, must state age, experience, qualifications and salary required. Where convenient selected applicants will be interviewed in towns near their address. [6743

AIRCRAFT stressmen required. Write, stating experience and qualifications, to Employment Manager, Vckers-Armstrongs, Ltd. (Aircraft Section), Weybridge. [6552

WANTED immediately for Camberley area, inspector(s) with considerable experience engine overhaul workshop. Salary £750 p.a., plus reasonable expenses.—Apply Box 3424. [6798

VACANCY exists at Lympne Airport, Kent, for licensed radio mechanic for work on Bristol "170" aircraft.

APPLY Manager, Silver City Airways, Ltd., Blackbushe Airport. [6818

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REQUIRED at Blackbushe Airport for work on post-war British aircraft: experienced engine and airframe fitters.—Applications to: Manager, Silver City Airways, Ltd. [6790

NAVIGATION INSTRUCTOR required for reserve flying school in the Midlands. Must be a member of the Reserve or be prepared to join.—Apply, stating qualifications to Box 3329. [6793

BROOKLANDS AVIATION, Ltd., have vacancies for airframe and engine fitters, electricians for servicing and repair of B.A.F. aircraft. Good wages and piecework bonus.

APPLY: No. 4 Site, Sywell, Northants. [0308

JIG and tool draughtsman required, fully experienced. —Applications, in writing, to Personnel Manager, Percival Aircraft, Ltd., Luton Airport, Beds., stating age, experience and salary required. [0560

JIG and tool draughtsmen required. Previous aircraft experience not essential. Pension and life assurance scheme.—Apply: Employment Manager, Vickers-Armstrongs, Ltd. (Aircraft Section), Weybridge. [6754

WANTED, flight engineers for York aircraft. "A" and "C" to cover York aircraft essential. - Apply: Chief Engineer, Eagle Aviation, Ltd., Luton Airport, Luton, Beds. [0810

DRAUGHTSMEN, senior and junior, required for aircraft design. Aircraft experience preferred. Excellent prospects for first-class men.—Apply Personnel Officer, Hawker Aircraft, Ltd., Kingston-on-Thames. [6769

JIG and tool draughtsmen and draughtsmen for layout engineer required. Prospects excellent for first-class men.—Apply to Personnel Officer, Hawker Aircraft, Ltd., Kingston-on-Thames. [6770

SITUATION VACANT

LINK TRAINER instructors required by Air Service Training, preferably with R.A.F. experience and categories.—Apply, in first instance, to The Commandant, Air Service Training, Hamble, giving full particulars. [6759]

APPLICATIONS are invited from design draughtsmen and stressmen; also technical assistants with combined design and performance experience for work on both reciprocating and gas turbine aero engines. [6760]

APPLICATIONS should state full particulars of experience and qualifications and should be addressed to The Personnel Manager, The de Havilland Engine Co., Ltd., Stonegrove, Edgware, Middx. [0675]

DRAUGHTSMEN required for aero engine l.t. and h.t. wiring, instrumentation and theoretical circuits in the London area. Suitably experienced applicants, who should be familiar with A.M. requirements, should write, giving full details, quoting ref. ACB to Box 3359. [6773]

AERONAUTICAL or mechanical draughtsmen and stressmen required, all grades. Apply, stating age, experience and salary required, to Alan Munts and Co., Ltd., Aircraft Section, Heston Airport, Hounslow, Middlesex. [6755]

SCHEDULE clerks required (male) with experience in compiling M.O.S. spares schedules.—Applications, in writing, stating age, experience and salary required, to Personnel Manager, Percival Aircraft, Ltd., The Airport, Luton, Beds. [0686]

CHIEF instructor/assistant airport manager required in west of England. Commercial licence and full G.A.P.A.N. endorsement must be held or be easily obtainable. Salary £900-£1,000 p.a. Pension scheme.—Box 3461. [6804]

AIRCRAFT draughtsmen with mechanical experience required for experimental and development work.—Apply, stating age, experience and salary required, to Chief Draughtsman, M.L. Aviation Co., Ltd., White Waltham Aerodrome, Berks. [6782]

TECHNICAL authors and illustrators required. Knowledge of M.O.S. procedure desirable.—Applications in writing, stating age, experience and salary required, to Personnel Manager, Percival Aircraft, Ltd., Luton Airport, Beds. [0694]

WANTED by aircraft charter company at Luton Airport, airframe and engine fitters, preferably with R.A.F. experience in Group 3 trades. Experience on York aircraft and Merlin engines an advantage, but not essential. [6811]

LICENSED aircraft radio engineer also required immediately.—Apply to Chief Engineer, Eagle Aviation, Luton Airport, Beds. [0811]

GLOSTER AIRCRAFT Co., Ltd., have vacancies for fully-experienced aircraft structural and electrical draughtsmen.—Applications, in writing, stating age, experience and salary required, to Employment Officer, G.A.C., Ltd., Hucclecote, Glos. [0910]

REQUIRED immediately, "A" and "C" licensed engineer, some experience approved inspection organization desirable. Also fitters, airframe and engine, required.—Apply: Air Schools, Ltd., municipal Aerodrome, Wolverhampton. [0925]

SENIOR and junior weight engineers required. Interesting work on new projects. Permanent positions offered to suitable applicants.—Apply, stating age, experience, qualifications and salary required, to Chief Designer, Gloster Aircraft Co., Ltd., Witcombe, Glos. [0912]

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BRITISH OVERSEAS AIRWAYS Corporation have a vacancy for a draughtsman at London Airport with experience in aircraft and engine design. A.E.S.D. rates. Good pension, sickness and holiday arrangements.—Write to Staff Manager, London Airport, Feltham, Middlesex. [6812]

STRESS calculator. Experienced men required by aircraft engineers in Midlands. Must hold National Cert. or equivalent qualifications. Excellent prospects for keen and competent man.—State fully details of experience and qualifications, age and salary required, to Box 3530. [6813]

DRAUGHTSMEN with experience in high quality light mechanical or hydraulic engineering are required by progressive Midland manufacturing company. Positions with good prospects are available to younger men. Salaries will be in accordance with age, qualifications and experience.—State details, together with salary required, to Box 3540. [6814]

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DRAUGHTSMEN are urgently required by well known medium to light engineering company, in the north-west. Remuneration of £500 and upwards will be paid to suitably qualified men. Applications, stating age, qualifications and experience in the first instance to Box 3492. [6810]

AIRCRAFT fitter assemblers required by de Havilland Aircraft Co., Hatfield, offering good working conditions, modern equipment, opportunities for advancement. Superannuation scheme, sports club, etc.—Apply by telephone: Hatfield 2345, in person, or by letter addressed to Personnel Manager. [0930]

ENGLISH ELECTRIC invites applications from suitably experienced draughtsmen for aircraft work at Warton or in London, men interested in three permanent positions should write quoting Ref. 130P to Central Personnel Services, English Electric Co., Ltd., 24/30, Gillingham Street, London, S.W.1. [6801]

STRESSMEN required for work on interesting new projects in guided weapons. Aircraft stress experience desirable but not essential. Good prospects and salary to suitable applicants.—Please write stating experience, qualifications and salary required (quoting Ref. F.12) to Box 3460. [6803]

AIRCRAFT engineers, fitters airframe, fitters engine, radio, electrical and instrument engineers and an experienced parachute packer are required for service at Bovingdon Airport. Good rates of pay, bonus and proficiency pay. Apply in writing to Technical Manager, Lancashire Aircraft Corporation, Bovingdon Airport, Hemel Hempstead, Herts. [6765]

AIR FORCE, Naval, civil and helicopter aircraft all under design and development at Percival Aircraft, Ltd. Applications are invited from senior and junior draughtsmen, and stressmen, for work on this interesting programme. Write, giving details of experience and salary required, to Personnel Manager, Percival Aircraft, Ltd., Luton Airport, Luton, Beds. [0695]

HANDLEY PAGE, Ltd., require an electrical technician, preferably with H.N.C. (Elect.) and with a knowledge of electronics, for work in connection with the development of aircraft electrical circuits and installations.—Write, stating age, qualifications and details of experience, to Staff Officer, Handley Page, Ltd., Cricklewood, London, N.W.2. [6752]

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DEVELOPMENT engineers and senior draughtsmen required with experience in light hydraulic controls and/or fuel metering equipment; also detailing draughtsmen for this type of work. The factory is situated in the grounds of a country house and the wages and conditions are excellent. Hostel available. Write, Personnel Manager, Dowty Equipment, Ltd., Arle Court, Cheltenham. [0903]

THE GLOSTER AIRCRAFT Co. requires senior and intermediate stressmen to work on designs and projects of advanced interest. Excellent prospects of advancement for sound and energetic men. Apply, in first instance, giving full particulars of technical qualifications, age, experience and salary required, to The Chief Designer, Gloster Aircraft Co., Ltd., Hucclecote, Glos. [0911]

HANDLEY PAGE, Ltd., have vacancies for senior and junior technical assistants in their mechanical and structural test departments at Cricklewood and Radlett. Qualifications should include a degree or Higher National Certificate. Previous experience is desirable but not essential.—Write, stating age, qualifications and details of experience, to: Staff Officer, Handley Page, Ltd., Cricklewood, London, N.W.2. [6738]

HANDLEY PAGE, Ltd., have a vacancy for a technical assistant with a good mechanical engineering background, who will be required to carry out work in connection with thermo-dynamic problems for aircraft air conditioning and thermal de-icing systems. Write, stating age, and giving particulars of qualifications and experience to: Staff Officer, Handley Page, Ltd., Claremont Road, London, N.W.2. [6751]

BRITISH EUROPEAN AIRWAYS have vacancies for instrument mechanics, radio mechanics, electricians, sheet metal workers, airframe and engine fitters. Hourly rates 9/10 plus 4½d. provisional bonus, plus up to 3d. proficiency pay. Opportunity for good bonus earnings. Pension, insurance and sick pay schemes; two weeks' paid holiday a year; air travel concessions. Apply: Personnel Officer, B.E.A., Northolt Base, Ruislip, Middlesex. [6741]

HANDLEY PAGE (READING), Ltd., have vacancies in their design office for senior and junior draughtsmen with aircraft experience. Also required are stressmen, who should have at least two years' experience and with a degree or Higher National Certificate with endorsements in aeronautical subjects. These positions are progressive and offer excellent opportunities to the right men.—Please send full particulars to the Personnel Office, Handley Page (Reading) Ltd., The Aerodrome, Woodley, Reading. [0901]

THE GLOSTER AIRCRAFT Co. requires the services of a number of aerodynamicists, (a) for design and project work, and (b) for flight test rection. Opportunity exists for individuals to vary their experience within the Aerodynamics Department. Candidates with some years' experience preferred, but applications from juniors with sound mathematical ability will receive full consideration Apply, in the first instance, giving full particulars of age, experience and salary required, to The Chief Designer, Gloster Aircraft Co., Ltd., Hucclecote, Glos. [0913]

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MECHANICAL engineers are required for laboratory work on the design and development of fuel system equipment for aircraft gas turbines. Applicants should be of degree standard and should possess qualities of ingenuity and inventiveness. The positions, which permit good scope for initiative, call for a practical experience of small mechanisms and a theoretical knowledge of hydraulics. The work is varied and interesting and the positions are permanent with attractive salaries.—Write, stating qualifications, experience and age, to Personnel Manager, Joseph Lucas, Ltd., Gt. King Street, Birmingham. [6815]

LARGE Coventry engineering company invites applications from men up to approximately 42 years, with personality drive and ambition, for appointments in group sub-contract and jig and tool control: (1) section technical assistants with administrative ability and many years' engineering experience, preferably knowledge of gas turbine engines though not essential. Sheet metal experience also an advantage. (2) Section leaders, and (3) Material and external progress assistants experienced generally as (1), also in scheduling suppliers and maintaining production requirements. (4) Outside progress chasers, capable efficient liaison work. Company operates superannuation and life assurance schemes, and offers excellent prospects.—Write full particulars, experience, including technical, age and salary. Apply Personnel Manager, Armstrong Siddeley Motors, Ltd., Coventry. [6795]

MINISTRY OF CIVIL AVIATION. Vacancies exist for briefing officers to co-ordinate, display and disseminate to aircrews information necessary for safe and expeditious flights. Applicants must have had flying experience at home or abroad as pilot or navigator and should have had experience in air navigation at least up to Senior Commercial Pilot's Licence standard. In exceptional cases candidates without these qualifications, who can produce evidence of other appropriate experience may be considered. Candidates must be of British nationality and must be at least 25 years of age. Posts are temporary and non-pensionable and applicants must undertake to serve anywhere in the U.K. Salary ranges from £430 to £600 per annum (London rates, reduced for service in the provinces), starting pay will depend upon age, qualifications and experience. Written applications, giving date of birth and education, full details of qualifications and experience of posts held (including dates) should be addressed to: Appointments Officer, Ministry of Labour and National Service, I-6, Tavistock Square, W.C.1, quoting ref. No. J.O.55 within ten days of appearance of this advertisement. In no circumstances should original testimonials be forwarded. [6794]

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WANTED, V.H.F. Radio, 12 volts, single or multi-V channel, Murphy or similar.—Box 3462. [6794]

STEEL, aluminium, brass sheets, strip, bars, off-cuts. Any quantity, immediate payment.—Gradon Sheared Metal Co., Ltd., Green Lane, Hounslow, Middx. Tel.: Feltham 3274. [6789]

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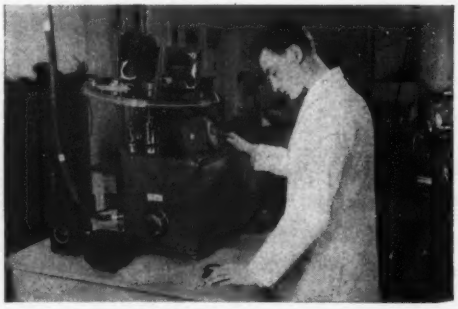

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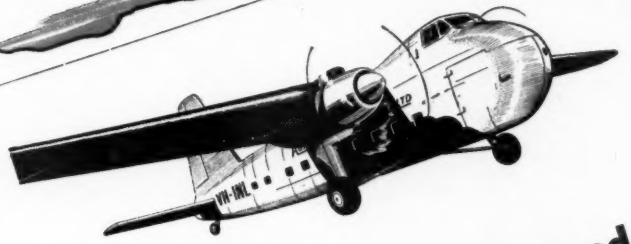

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